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The Canadian
Medical Association Journal

Vol. X. TORONTO, APRIL, 1920 No. 4

OBSTETRICS AND THE STATE

By K. C. McIlwraith, M.D.

Toronto

CUSTOM seems to have ordained that your chairman should, at the opening meeting of his section, deliver an address, and that the subject of such address should be as broad and general in its application as the limits of the section permit. Having this in mind, then, I have chosen as my text for the evening, the subject of obstetrics and the state.

Should there be any such connection, and if so, what form should it take? To the first question, an affirmative answer has been practically compelled by two forces; the ever busy statistician, and the equally busy labour party. It was only the other day that a deputation appeared before Mr. Lloyd George with an earnest petition that his government should see to it that the benefits of twilight sleep should be brought within the reach of the wives of the poor. Last year the Ontario Medical Society was addressed by a representative of the Labour party from Toronto, who declared that, more particularly in obstetrics, labour felt itself at the disadvantage of being unable to secure for the wives of their class, those advantages that wealth could command, and was determined that government should adjust this inequality. Statistics have been under consideration for a much longer period, and the conditions they disclosed have been the subject of legislation in many countries.

I would ask you, therefore, to consider what are the problems involved; what steps have been taken in this and other countries

An address delivered before the Section of Obstetrics and Gynæcology, Academy of Medicine, Toronto, October 23th, 1919.

to solve them; and lastly, what personal views I may have to offer on the subject.

The fact is that there is an unnecessary maternal mortality and morbidity in pregnancy and childbirth, and the problem is to see how they may be reduced. I must ask your careful attention for a few moments while I lay before you some statistics on the question of maternal mortality.

Statistics are only with difficulty compiled and interpreted. Any one who wishes to know something of the difficulties peculiar to this department should read the report on maternal mortality in the United States made by Dr. Grace L. Meigs to the United States Department of Labour wherein they are fully and intelligently discussed. Very illuminating, too, are the reports on the physical welfare of mothers and children in Scotland, Ireland, England and Wales, by the Carnegie United Kingdom Trust, and the report to the Local Government Board for 1914–1915, on maternal mortality in connection with child-bearing by Sir Arthur Newsholme. The most useful table shows the number of maternal deaths to one thousand living births, the proportion of those deaths due to sepsis, and the direction in which the figures are tending, in England and Wales.

On the occasion of his recent visit to Toronto, Sir Arthur Newsholme told us that in England and Wales 75 per cent. of the midwifery is done by midwives. In the discussion which preceded the passage of the midwives' bill in 1912, an eminent British surgeon made the statement that the physician, in England, was practically left to acquire his obstetric education at the hands of "ignorant howdies" who had no scientific education and were apparently guided in their practice only by the traditions of their class. The midwives' bill provided that a midwife must have a three months' (since increased to six months) training at an obstetrical centre. She was then registered after examination. She was compelled to call in medical aid in obstetrical difficulties, and to report sepsis. Officials were also appointed to supervise the work done, and a midwife could be suspended for due cause. The bill applied only to *England and Wales*.

In these countries, then, there was found at first, a maternal mortality of 4·65 per 1000 living births, of which 2·24 were due to sepsis, a proportion of 48 per cent. of the whole deaths. During the ten years, a steady fall took place until in 1910 the total maternal mortality was 3·69 per 1000 living births, of which 1·44 were due to sepsis, a percentage of 39. The decline in both

cases was progressive. The figures for total mortality during the period do not include deaths from puerperal nephritis and albuminuria, and should, therefore, be much higher. During the years 1911–1915, the figures remain practically stationary on the basis of the old classification, but adding the nephritis cases, the figures are for total mortality 4·2 and sepsis proportion 33 per cent. *In the provisional registration area of the United States* in 1910 the total rate was 6·5 per 1000 living births, with sepsis at 2·9, providing a proportion of 44 per cent. New York City probably brought the figures up that year by providing the enormous mortality of 10 per 1000, with 5·7 or over 50 per cent. of the total due to sepsis. This was, no doubt, due largely to great numbers of the poor being attended, as Edgar pointed out, by wholly untrained, dirty and ignorant midwives, a condition which has since been much improved. In Ontario during the years from 1909 to 1918 inclusive, the figures kindly furnished me by the Registrar-General show a total mortality of 5·4 per 1000 living births with sepsis accounting for 1·88 or a percentage of 35. This percentage was 33 in 1909 and 31 in 1918.

I have taken the three English speaking countries to illustrate the point, but Dr. Meigs gives those of fifteen other countries. It is pointed out that, owing to numerous statistical pitfalls, which are discussed in detail, no sweeping general deductions or comparisons can be made. One source of error may be referred to, the practice of reporting a cause of death without mentioning its connection with pregnancy or childbirth. In England and Wales, when the death of a woman of child-bearing years is reported, the Registrar-General sends the physician a confidential letter requiring him to state whether the death was in any way connected with childbirth. The replies to a long series of such letters resulted in the transference of nearly 8 per cent. of the cases from the general to the puerperal column. Another interesting fact is that in twelve countries whose statistics have been analyzed for the purpose of ascertaining what per centage of the total death-rate is due to sepsis, it has been shown to vary from 30 to 50 per cent. We believe that this death-rate is nearly all preventable; and this, only one of the preventable causes. But I must not dwell too long on statistics. Out of the huge mass of them arise these facts: Some countries, *e.g.*, England and Wales, show a death-rate from puerperal causes steadily falling from 1901 to 1910, and remaining practically stationary during the next five years. Some show an almost stationary rate, in which class stands Ontario. It is true

that the last year has the lowest death-rate, but there is no progressive decrease. Our death-rate is not the lowest, but stands, with the majority, about the middle of the list. One country, Scotland, shows an increasing rate, *i.e.*, from 4·7 in 1901 to 6 in 1914. The increase does not, however, appear to be due to sepsis. Lastly, the low rate in most countries has been reached after a vigorous public campaigh and much legislation, but in Ontario the government has not yet moved.

So much for the problem. We have next to consider what has been done about it. In England and Wales the improvement in the death-rate has been attributed to the enactment of two measures—the midwives' bill above referred to, and the Health Insurance Act, which includes maternity benefits. The last named act is compulsory, and covers all wage earners whose annual income falls below a certain sum. The wives of workers, married and unmarried women, are insured against the trials of maternity. The benefits are, a cash bonus of thirty shillings, and the provision of medical attendance. Rest for a period of six weeks is enforced, at least four of which must be after the birth has taken place. In as much as the rest is compulsory, it is deemed fair that where the insured is herself a worker, she should receive as a benefit a fixed proportion of her weekly wage during that time. This in addition to the cash bonus. The act was administered by co-operation with local benefit societies, and local government boards. More recently a Ministry of Health has been established which has sole charge of the administrative end.

It is a curious commentary on the fact that almost none of the numerous friendly societies included maternity benefit in their insurance schemes. If they found that they could not do so, surely this is an additional cause for the government to intervene.

In addition to these measures, maternity and child-welfare centres have been established, and a campaign of education and help set on foot. The funds for insurance claims are provided by a levy on the wages of the insured or her husband, on the employer, and by government contributions. In all countries that have moved in this matter at all, health insurance, including, for our purposes, maternity benefit clauses, has been the line of action.

The Senate of New York State passed a bill of this kind this year, which was afterwards turned down in some mysterious manner. It is to be introduced again next year.

In Ontario, no work has as yet been done by the government, but other agencies have been at work in municipalities, and more is

in contemplation. Hospitals have extended their out-patient work, so as to extend the benefits of their laboratories and staff amongst the poor. In the Toronto General Hospital the Golden Rule Guild, an association of the nurses, has furnished visiting nurses to aid this work, and the Associated Charities have taken them on their list. Should the State lend a hand? Why not? Look at the vast amount that has been done with regard to tuberculosis, typhoid fever, diphtheria, scarlet fever and other diseases, the laboratories in which expert diagnosis is made and sera furnished. Surely our work is of no less importance to the State.

Let me now call your attention to some causes of puerperal death, which seem to me to be in operation in this country.

1. Let us first examine *ourselves*. Many years of observation have led me to the conclusion that some, at all events, of the morbidity and mortality in child-birth has resulted from meddlesome midwifery. There is too great a tendency to injudicious, and particularly to premature, use of forceps. Furthermore, an obstetrician is, by virtue of his office, a surgeon, and must exercise as much care in this branch of the work as is exercised in any other. Many men, doing obstetric work in hospitals fail, I am afraid, to realize the value of the precautions by which their work is there surrounded. The aseptic delivery room, sterilized water, solutions, dressings, instruments and ligatures; the preparation of the patient for delivery, the gloves, gowns, caps and masks, with which they are supplied, are taken for granted, laughed at or even refused. If called upon to reproduce these conditions in a private house, it seems likely that many of us would not know how, or would not take the trouble.

2. *The patient.* The general public is grossly ignorant of the real dangers of parturition, and inclines to think the effort of the careful obstetrician mere ostentation. Amongst the better class of patients a great improvement has taken place, most people now demanding that supervision which they used to reject. Vast ignorance still persists among the poor.

3. *The surroundings.* Much obstetric surgery—instrumental deliveries, versions, repairs of the perineum—is freely undertaken in surroundings that make it unsafe. It is the venue of the case, I believe, quite as often as a failure of mechanical skill on the physician's part, that leads to disaster. But for this feature, the physician must bear the responsibility.

4. *The climate.* One curious fact comes out in Sir Arthur Newsholme's report—that the mortality noticeably increases the

farther north we go, being lowest in the southern, higher in the midland, higher still in the northern countries of England, and highest of all in Scotland. Perhaps no great significance attaches to this fact, but it is certainly in accord with my own observations on the effect of climate in the city. In spring and fall, great changes are likely to take place, suddenly, and such changes markedly affect, for instance, the prevalence of eclampsia Then, again in the cold season, when our houses are necessarily closed against the weather, many diseases, and amongst them puerperal sepsis, are more liable to occur. The effect is, of course, much more obvious where housing and sanitary conditions are defective, and shows the linking up of our subject with other welfare movements.

In conclusion, I have some suggestions to offer as to what might be done here.

Education of students and nurses. I cannot pass by this opportunity to bear my testimony to the admirable use which my colleague, Professor Watson has made of the opportunities placed at his disposal. The students have been allowed, and indeed, compelled to avail themselves to the utmost of the greatly increased facilities which the opening of the new General Hospital have afforded. I am confident that this factor alone will have a very beneficial effect in years to come. More meticulous reports of the work done, and their wider dissemination would, I feel, further the good work. For example, my colleague, Dr. Gordon Gallie, has handed me a report of the outdoor clinic work done since the clinic was established. It reads as follows in regard to eclamptic toxæmia:

1. Total number of patients confined in Burnside.	3,990
2. Total number of patients who have attended the Burnside out-patient clinic.....	1,795
3. Total number of clinic patients who have been confined in the Burnside.....	1,457
4. Total number of eclampsias treated in Burnside.	36
5. Pre-eclamptic toxæmia discovered in clinic patients.....	38
6. Results of these pre-eclamptic cases:	
36 normal babies at or near full time.	
2 inductions of labour near time.	
38 healthy mothers left hospital.	

36 live babies (two died within first week).
2 still births.

34 live babies left hospital.

7. Number of eclampsias developing in clinic patients..... 1

This patient was urged to come into the hospital a month previously, but refused.

Government.

(*a*) Registration of the cause of death in women of child-bearing years should be more carefully investigated, and the statistics amended as has been done in England.

(*b*) More fully classified reports should be issued on the causes of maternal deaths.

(*c*) A propaganda should be started for the better education of the public in maternity affairs, by means of literature and the establishment of maternity centres in rural districts and municipalities, at which patients could attend for periodical examinations of urine, blood-pressure and general health, and by home visitation by trained workers.

(*d*) There is an especial and crying need for convalescent homes to which puerperal women might be sent after their discharge from public hospitals or ordinary medical supervision.

(*e*) Health insurance, with, for our purpose, maternity benefits. Many countries have followed this course, but I could not undertake to urge it without a further study of the results produced. I might, however, discuss some aspects of it. As the insured contributes to the fund, her right to cash benefits cannot be denied, but I am opposed to cash benefit by the State. I remember once being met by an indignant husband who objected to his wife being moved to a hospital. "When my wife," said he, "was known to be sick, people were sorry for us, and gave us things; but now you are going to take her to a hospital, and what am I going to do for a living?" Why should public money be spent in supporting such a man? The best thing the State could have done would have been to have administered Cromwellian discipline and "knocked him on the head". In Great Britain a pamphlet was published containing letters of poor mothers who were asked to state their cases. One of them had a large family, and a reporter from the *Spectator* interviewed her. "Your older children ought to be able, now, to help you," said the reporter. "Well," said the

mother, "I thought so too, but the more I get from my sons, the less I get from my husband." As the editor remarked, "If for 'sons' we substitute 'State', we have the argument against State cash aid."

Many enthusiasts for maternal insurance carry the idea to extreme lengths, advocating motherhood insurance or practically the State support of the mother. "In fact," says one critic, "they seem to think that the husband should be allowed to initiate the pregnancy and that the State should do the rest." Extremes of this kind seem to lead directly to Bolshevism, under which doctrine, as you know, children are to be taken from their parents in order to prevent the development of any family feeling, or any sense of love or duty to anyone except the State. The insurance benefit which the State might assume, in addition to those mentioned above, would be the provision of sterilized dressings, sheets, etc., for the accouchement, and in some cases for nursing and medical attendance. Then, too, the authorities should be the judges as to whether the patient should be confined at home or in a hospital. Two or three years ago, I was called to see a patient living not half a mile from the City Hall. I had to stoop to enter the low-browed shop, slipped awkwardly on the greasy floor, and landed in the bosom of the family. There they stood, clad in rags, dirt, and long beards, solemnly staring. I asked for some means of washing my hands, and was shown into a filthy kitchen, where in a dirty sink, stood the remains of the last meal, and the beginnings of the next, with a feeble trickle of cold water running over them, from a rickety tap. No soap! I was next shown to the lying-in chamber, and in the obscurity walked in to the end of the bedstead, and had to back out again to allow the husband to get out, before I could get in. There, on dirty bedding, lay the mother gazing through the one dirty window on a huge pile of old iron and general junk which represented the fruits of her husband's industry. She had a high temperature. I insisted on her removal to the hospital, and gained my point after some argument. It was not necessary to do anything for her, beyond reducing her to a state of approximate cleanliness, and in a few days she was well but melancholy. Inquiry developed the information that she was home-sick. Had she been a Kipling student I could have imagined her saying:

"The fatted calf is dressed for me,
But the husks have greater zest for me;
I think that my pigs will be best for me,
And I'm off to the styes afresh."

On another occasion I was shown into a chamber absolutely bare of furniture, except for the bedstead. Around the walls was arranged the usual collection of junk. Across the bare floor in the center of the room, crawled various vermin. On the rickety old wooden bedstead was piled a huge feather mattress, in which the patient was sunk, with another equally huge feather mattress covering her, between which Scylla and Charybdis I was supposed to exercise the functions of an expert obstetrician. To introduce a tidy nurse and sterile dressings into such surroundings would be but lost endeavour. The State should not be required to waste its good materials there, but should have the power to order removal to an hospital. In countries where the State has some such power, it has been found to be a great stimulus to home cleanliness.

In regard to the period of rest enforced by the health insurance regulations of some countries, one should remember that the "rest" referred to means simply abstinence from gainful employment. Thus many women would be compelled to stop work who might have continued without detriment, and many who need to stop sooner or rest longer, cannot do so under the insurance protection. Further, the "rest" given is inadequate, for many women need rest from family cares and surroundings quite as much as from work. It is for these reasons that rest homes and convalescent homes are strongly advised.

I cannot, sir, hope to cover this great subject in a detailed manner, and there are many interesting questions upon which I have not touched. All that I have sought, is to attract the attention and to arouse the interest of the Fellows in it. The most casual survey of the actions of other countries show that legislation of some sort, in Ontario, is inevitable, and it is the part of wisdom for us to be prepared.

For ready aid in the preparation of the paper, I owe sincerest thanks to our librarian, to Dr. Locke of the Public Library and his staff, to Dr. Hastings, to Dr. MacMurchy, to Dr. McCullough, and his staff, and to my colleague, Dr. Gordon Gallie.

THE GENESIS, CLASSIFICATION, INTERRELATIONSHIPS AND CLINICAL DIAGNOSIS OF DISEASE

By H. B. Anderson, M.D., L.R.C.P. (Lond.), M.R.C.S. (Eng.)

Toronto

THE means for the prevention, relief, or cure of disease have naturally varied from time to time according to prevalent conceptions of what disease is and how it arises, that one may be pardoned for tracing briefly the evolution of medical thought leading up to our present views on the subject.

In a primitive way, medical art is as old as human pain and suffering, antedating for thousands of years organized society or any theories touching the origin of disease. Its earliest application is suggested by certain instinctive, or purposeful acts, common alike to man and animals, as the relief of irritation by scratching or rubbing, of pain by position, the healing of wounds by sucking or licking, and similar measures. Allied to these, but more complex in action, is the protection afforded by the automatic response to fear, rage, hunger, pain, and other emotional disturbances. Thus instinct, automatic action, the emotions, and the empirical observation of these and of the causes, symptoms, course and natural cure of sickness or injuries, furnished useful information of ailments or *dis*-ease and of measures for their relief, which in time became general knowledge, and constituted the ground work of primitive medicine.

As social organization developed and in course of time the ancient Sumerian, Babylonian, Assyrian, Egyptian, Persian, Indian, Jewish, and other oriental civilizations arose, empirical observation continued to add to the primitive knowledge of disease, but another current of thought appeared as well. With the mystical tendencies of Eastern nations, evident in their religious beliefs, attributing the control of human affairs to supernatural powers, disease was regarded as something foreign to the body, imported from without,

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Read before the Kingston and Frontenac County Medical Society, December 9th, 1919.

or sent as an evil spirit in punishment for wrong doing. This demoniac or *supernatural* view of disease naturally led to its relief being sought through *supernatural* means at the hands of the priesthood. Thus we have the origin of Sacerdotal medicine, the practice of which was in the hands of the priest-physicians, an alliance of religion and medicine that has not been conducive to scientific progress in any age.

Primitive and Sacerdotal medicine, therefore, were different in origin and divergent in course; nevertheless, aided by empirical observation, medicine made remarkable advancement especially in hygiene, dietary, and other practical measures, notably among the Egyptians and Jews. In the early days the art was far in advance of systematized knowledge or the science of medicine, and remained so until comparatively recent times, and practical progress was largely through empirical observation.

It was in Greece, with her free institutions, thirst for knowledge, philosophic intellects, unfettered reason, and capacity for critical judgement, that this mixture of primitive medicine, mysticism, and empiricism was collected, critically examined, enlarged and finally built up into a system which was to dominate medical thought for many centuries.

While the material was derived from many sources and many labourers contributed, the chief glory for the accomplishment is due to Hippocrates (460 B.C.), the father of medicine and the greatest name in its history. Hippocrates discarded mere speculation about disease for accurate observation of its symptoms and course in the individual patient, and though his attempt to explain them on the basis of his *humoral* pathology, is now only of historic interest, yet he indicated the method and enunciated principles which laid an enduring foundation for future development. He rejected the idea of a supernatural origin of disease and grasped the principle that "morbid symptoms are the result of morbid stimuli" and "that natural powers are the healers of disease".

How nearly his enlightened views approached the modern scientific conception of disease and what progress might have been made had they been followed, is interesting to contemplate, but his clinical observations could not be developed by reason of the lack of knowledge in other branches. His advice to the physician "to do good or at least do no harm" and "to do nothing without a purpose" is as applicable to rational treatment in our day as in his.

The metaphysical conceptions of Aristotle (384 B.C.), based

largely on speculation in place of observation of disease in man, while of interest to science in general, added nothing of special value to medical knowledge.

Greek medicine, debased rather than improved after Hippocrates, was transmitted to the Romans through Celsus (*circa* 25 A.D.) and Galen (131 A.D.) and, after the Mohammedan invasion of western Europe and the dismemberment of the Roman Empire, its influence was continued through the Arabian school, and represented the best in medical thought during the middle ages. Classification such as it was, up to this time, was on the basis of symptoms or on regional anatomy of the most primitive sort.

It is evident that no structural basis in explanation of disease was possible in the period before human dissection, and we need not take time to discuss the many speculative theories which arose from time to time. Human dissection which had been practiced by the Alexandrian school under Herophilus and Erisasotratus (280 B.C.) was finally discontinued owing to the opposition of the Church, about the first century of the Christian era, and was not generally resumed until the later days of the Renaissance, in the time of the great anatomists of the sixteenth century—Sylvius (1478), Fallopius (1523), and Vesalius (1543 A.D.). Dissection naturally gave a new starting point and impetus to medical knowledge.

The discovery of the circulation of the blood by Harvey (b. 1578) and the final publication of his investigations in 1628, mark an important epoch in medical progress, not only in the knowledge obtained, but in the application of scientific methods of experiment to its attainment.

About the same time, Leewenhoek introduced the microscope, thus making possible the study of the *minute* anatomy of organs and tissues. The microscopic study of normal tissues was begun by him and Malpighi (b. 1628), and afterwards was extended by others to the investigation of diseased structures as well.

In the eighteenth century, Morgagni (1682), a pupil of Valsalva, laid the foundations for the study of pathological anatomy, thus revealing the gross structural changes of disease in the organs and tissues. His great work, "De Sedibus et Causis Morborum," was published in 1761.

The knowledge of anatomy—normal and pathological, including microscopic anatomy, made possible an attempt to correlate the symptoms of disease with structural changes found *post mortem*, and classification on an anatomical basis steadily progressed during

the next century. This was important from the scientific standpoint, but fell short in the lack of information it furnished of the causation of disease and of *early* structural changes in its course. The pathological anatomist, viewing the ruins of disease—Nature's failures to cure—naturally took a gloomy view of the possibilities of repair and the efficacy of treatment. This resulted eventually in a period of therapeutic nihilism, which set in and continued through the early part of the nineteenth century.

From the midst of this atmosphere of despondency arose a spirit of idealism and enthusiasm for scientific knowledge which heralded the dawn of the golden era in medical progress. The clinical schools of Paris, Vienna, London, Edinburgh, Dublin, and other centres, each had its group of brilliant investigators and clinicians who contributed greatly to medical advancement, especially to the morbid-anatomical knowledge of disease and methods for their physical diagnosis—but treatment also began to receive more attention. To appreciate the fundamental importance of the scientific work of this period, the physician or specialist of our day need only recall some illuminating theory, new method, disease, discovery or other contribution to medicine, associated with such illustrious names as John Hunter (1728), Pinel (1745), Astley Cooper (1748), Pott (1749), Corvisart (1755), Baillie (1761), Bichat (1771), Broussais (1772), Sir Charles Bell (1774), Dupuytren (1777), Cheyne (1777), Laennec (1781), Magendie (1783), Brodie (1783), Travers (1783), Louis (1787), Bright (1789), Cruveilhier (1791), Addison (1793), Liston (1794), Andral (1797), Graves (1797), Trousseau (1801), Stokes (1804), Simpson (1811), Bernard (1813), and many others.

Thus the old supernatural ideas and speculative theories eventually vanished in the light of increasing knowledge, and the anatomical basis, dealing with the advanced morbid changes found *post mortem* rather than with the origin and early *functional disturbances* and *course* of disease, was recognized in itself as inadequate.

Then began an effort under the influence of Virchow and his followers to establish medicine as an exact science on the broader foundation of pathological anatomy, experimental physiology, chemistry, physics, and other applied sciences. The wonderful impetus given to this movement by the discoveries of Pasteur, Koch, and hosts of others during the past fifty years is too well known to require emphasis and has continued unabated to the present day.

Nor must we overlook the great debt that scientific medicine owes to the post-Listerian surgeon, whose successful invasion of every part of the body, with the opportunity it afforded for studying pathology in the living, and of noting the earlier changes in disease and the capacity of the times for repair, had much to do with dissipating the pessimism that had developed as the result of dead-house experience.

The labours of Cohnheim were especially productive in bringing medicine in line with other physical sciences. Disease was to be studied as a ready-made experiment, differing from that of the laboratory only in that the circumstances of occurrence, and the nature, and the amount of the agent producing it, were not under control. The causes of disease were to be sought in agents and influences in the individual's environment.

The body was recognized to possess many regulative or compensatory mechanisms by which it is enabled to adapt itself to varying external conditions and yet maintain that state of function and structure of its organs and tissues which we speak of as health. Whenever, from stress of environment or weakness of its regulative mechanisms, the organism is unable to adapt itself to the external conditions surrounding it and perform its functions normally, we have the appearance of *changes* in structure or *disorders* of function which we speak of as disease. There is therefore no essential difference between health and disease, and no sharp line demarcating the two states, the lower latitudes of health shading off into disease.

The one represents the reaction of the organism under *normal* conditions, the other the reaction under *abnormal* conditions. They are both governed by the same natural laws. The health of the individual or his ability to withstand disease, depends upon his capacity for adaption to varying environmental conditions.

If we consider for a moment, the daily variations in external conditions to which the organism is called upon to adjust itself —the air as to purity, temperature, moisture, and pressure; the quantity and character of food and drink; occupation; hours of rest and labour; clothing; various emotional disturbances; traumatic, chemical and other irritants; exposure to infection by the myriad low forms of animal and vegetable life—we marvel at the efficiency of the regulative mechanisms by which health is maintained and are not surprised that at times they fail and disease arises. Nor do we wonder that, with the increasing complexity of life, with new occupations and pursuits, new conditions of living, that new diseases should continue to appear. One need only mention in

illustration, beri-beri from eating polished rice, caisson disease among divers from excessive atmospheric pressure, *x*-ray dermatitis, or more recently, shell shock, the neuroses, trench feet, and other diseases due to war conditions. In instances such as these, cause and effect are usually readily apparent.

In the nineteenth century, the increasing knowledge of physiology, dealing with the functions rather than the structure of the organs in health, was naturally followed by the study of derangements of function encountered in disease—pathological physiology, or general pathology—and an explanation of symptoms was sought for on this basis. This marked a great step in advance, disease being studied from the standpoint of disordered functions, as well as from that of morbid anatomy, as a process subject to change from day to day, rather than a fixed anatomical condition, thus leading us back to disturbances nearer the initiation of the departure from health.

The advantage to clinical diagnosis from new methods for testing the functional capacity of different organs emphasizes Krehl's statement "that our knowledge of morbid processes depends primarily on the stage of development of methods for their investigation."

I wish now to focus attention especially upon two factors (*a*) environment, wherein we seek the causes of disease and (*b*) the regulative mechanisms, systemic resistance or defensive mechanisms, by which the organism reacts against these causes. According to the conception of disease as a local or systemic reaction against deleterious influences, it is *conservative* in purpose, an attempt at preservation, and its phenomena should be considered from this point of view. Thus pneumococci and associated organisms, taking advantage of the morbid opportunity of lowered resistance, are the enemy, the inflammatory changes in the lungs which we call pneumonia, are part of Nature's defence and the various symptoms which appear, are expressions of disordered functions resulting from the conflict.

Reflection on this conception of disease will acquaint us with the limitations of our powers to control or modify it. We cannot alter to advantage the structure of the healthy body, endow its organs with new functions, nor change the laws governing them, but we have an immense influence over the external conditions affecting them and the efficiency of their work. Among these conditions are included, of course, all our remedial measures.

It is unnecessary for one to enter into the complex problem

of local and systemic resistance, including such factors as the mechanical protection of the covering epithelium, the germicidal action of secretions, phagocytosis, the various antibodies—coagulins, opsinins, agglutinins, preciptins, hæmolysins, antitoxins, etc., in the blood serum, the chemical reactions in tissue and food metabolism, the rôle of various internal and external secretions, the influence of the nervous and vascular systems in control and mobilization, the disposal of waste and other physiological functions.

I wish by enumerating them, however, to emphasize that the system of defence, especially against infections, is a very broad and complex one, involving widely the organs, tissues and secretions of the body and their functions, and from its nature is not limited by anatomical boundaries, though certain tissues may show a selective affinity for certain pathogenic bacteria. In looking for evidences of disease, therefore, we must take a comprehensive view of these reactions and not expect them to be limited to any one organ. Functional disturbance is often the earliest manifestation, preceding demonstrable organic change, and as in epilepsy, may be the only evidence of trouble.

For this reason, the anatomical classification suggested by such terms as pneumonia, pleurisy, nephritis, peritonitis, etc., is too narrow, in that it emphasizes structural more than functional changes, *effects* rather than *causes* and reactions in one organ, minimizing the importance of the general systemic response. For purposes of systematic description in text-books it may be necessary to deal with diseases of various organs in this way, but this method is not applicable at the bedside.

Autopsy experience teaches us that morbid conditions found *post mortem* are usually interrelated, and not the result of different causes. It is a good clinical rule never to assume the existence of two or more unrelated pathological processes where one can suffice to explain the symptoms. From the nature of the processes of disease we expect *systemic* rather than only *local organic* involvement, and are thus prepared to find multiple expressions of it or interrelationships in disease. Not alone the morbid processes in the organs or tissues principally involved but the reactions elsewhere, disordered functions, vicious circles established, complications and sequelæ, are all essentially parts of the disease process.

Many interrelationships in disease are well recognized such as tonsillitis, rheumatism, endocarditis, anæmia, chorea, erythema, multiforme; tonsillitis and nephritis; appendicitis, cholecystitis, gastric and duodenal ulcer; exophthalmic goitre and diseases of the

other glands of internal secretion, scleroderma and arthritis; Raynaud's disease, arthritis deformans, scleroderma, purpura and urticaria; and many others one might mention. The factor usually co-ordinating them is that each group represents reactions to a common cause.

Much light may be thrown upon the causation of certain obscure diseases by noting their occurrence along with others whose ætiology is known. Their frequent association is less likely to be accidental than the effect of a common cause. Disease, like man, may be known by the company it keeps. From this point of view all so-called complications and intercurrent conditions in disease should at least be considered.

At autopsy all the morbid conditions found are usually summed up in what is called the *anatomical diagnosis*. In a similar manner the *clinical* diagnosis of disease should include the causes and all the organic changes and functional disturbances arrived at by our most complete investigation. In this way we emphasize causative factors, get a more comprehensive view of local and systemic reactions from the beginning, more readily understand the reasons underlying disease-interrelationships, and are thus best enabled to apply rational measures in treatment. We individualize, investigate, and treat the patient rather than the disease. The method is objective, by the use of all one's senses, guided by knowledge and experience, and aided by all available laboratory and other means of investigation, seeking as in an experiment, to observe and analyze the reactions following an ascertained cause. Thus only do we train ourselves to habits of close independent observation and obtain knowledge at first hand as a corrective to too slavish a dependence upon book descriptions.

The ætiological basis of classification seeking the causes that initiated the local and systemic reactions and functional disturbances, is obviously the most scientific as well as of most practical value. The extent to which an ætiological classification is applicable is shown in the following table, based on an analysis by Gay of the diseases recorded in Osler's "System" and in the "Manual of the United States Army."

GAY'S TABLE

(Modified)

A POTENTIAL NOSOLOGY ON THE BASIS OF ÆTIOLOGY WITH PERCENTAGES OF DISEASES ON THE BASIS OF CAUSATION

PRIMARY OR ESSENTIAL CAUSES OF DISEASE			TYPE OF DISEASE PRODUCED
A. EXOGENOUS			
1. Animate	Bacteria, Protozoa, Spirochetes, Animal Parasites, Filtrable viruses	48.82%	Infections—Secondary or chronic disease due to continued disturbed function and to structural changes produced may follow.
2. Inanimate	Physical, Chemical	27.20%	Injuries, Intoxications
3. Unknown		18.41%	
	Total.....	94.43%	due to exogenous causes.
B. ENDOGENOUS	Metabolic diseases, Diseases of internal secretion, Constitutional diseases	5.57%	Some or all may eventually be shown to be due to exogenous causes. due to endogenous causes.
		100.00%	

If such a classification obtains, what shall we say of specialties limited to diseases of a certain organ as the heart, the stomach, the kidneys, etc., or even the teeth or tonsils? The special organ may not be the primary or even the chief seat of trouble. The narrowing effect of such specialism tends to obscure the view that organs and tissues are interdependent, and that the multiple processes of disease and defence mechanisms imply wider reactions.

For purposes of more intensive study and of acquiring technique in regional diagnosis and for certain aspects of treatment, specialties limited to certain organs may be necessary, but such specialism must be grounded on the widest basis of ætiology and general knowledge of disease, for it is based on exigencies of practice rather than on scientific reasons.

To illustrate the conception of disease which I have endeavoured to develop, its interrelationships and the question of clinical diagnosis, may I refer briefly to a subject that has received much attention during the past few years, viz.: focal infections and their

local and general phenomena—especially those connected with the teeth and tonsils.

When Spooner of Montreal, in 1838, introduced arsenic as a devitalizing agent for the dental pulp, he unintentionally initiated, in certain aspects of mechanical dentistry, the most far-reaching experiment that has ever been carried out on human beings. By this means a new set of conditions was set up and, as one would expect, a new series of disease-reactions resulted. In the light of knowledge acquired during the past few years, aided by the application of the *x*-ray to dental diagnosis, and by bacteriological and other clinical methods, this experiment may be now summarized:

Teeth, the peridental membranes and pulps of which had become infected by *streptococcus viridans* and which, by reason of the resulting pain, would have required extraction for relief, had their pulps destroyed by arsenic, and the necrotic material cleared out. In this way, the nerve—Nature's danger signal, was removed, as well as the chief source of the tooth's nutrition, viz. the vessels of the pulp. The resulting cavity was filled with some inert substance or the teeth were crowned, buttressed by bridges, or pivot teeth at times were inserted into devitalized roots. This resulted, in a large percentage of teeth (as high as nearly 80 per cent., according to A. D. Black's investigations), in sealing up in the pulp cavity, dental canals or at the apices of the teeth, of a streptococcus infection of a low grade of virulency, which often remained there for an indefinite period. The unsuspecting patient was thus exposed to the effects of multiple points of streptococcus infection, around what were virtually septic foreign bodies (dead teeth) embedded in the living tissues of the alveoli. Is it therefore a matter for surprise that a series of local and systemic reactions should develop in response to so potent a cause of trouble or that symptoms of it should arise, not all at one time but at intervals during the long period of exposure? I have complete records now of over one thousand cases, and from these I have selected a few to illustrate some conditions which have resulted, some disease interrelationships which have appeared and the clinical diagnosis arrived at by enumerating the local and systemic disturbances found on examination.

Mr. G. B., age 73; traveller; strong and vigorous; on examination presented the following:

Oral Sepsis—Strep. Non. Hæm. pivot teeth, crowns and fillings, gums unhealthy.
Arthritis—(shoulders)

Neuritis—(brachial)
Eczema
Urticaria—Angioneurotic œdema.
Rosacea
Effects of excessive tea—two strong cups per meal.

August, 1917, developed eczema and urticaria. Attributed to sweating while working on a farm during holidays.

Consulted me on May 27th, 1918.

Extraction of infected teeth recommended but refused. Other measures, eliminating tea—improved rosacea but urticaria continued—right side of lip swollen.

June 15th, infected teeth extracted, followed by severe epigastric pain, vomiting, extreme swelling of face and tongue, unable to speak. This subsided, but was followed by *giant* urticaria all over body. Prompt subsidence and cure.

Mrs. B., age 38; vigorous woman; clergyman's wife; presented the following :

Oral Sepsis
Tonsillitis—Staph. Aureus.
—Strep. hæm.
Cervical adenitis
Goitre—small, no exophthalmos.
Appendicitis—chronic—recurrent since fifteen years of age—fibrosed appendix removed December 10th, 1919.
Anæmia—90% Hbn.
Stomatitis—large herpetic ulcers.
Eczema—of lips.
Insomnia—marked.
Indicanuria

Symptoms developed after attack of influenza, October, 1918, by which the patient's resistance had been reduced.

Mrs. C., age 44; no previous serious illness, strong and vigorous.

Oral Sepsis—extreme; gums swollen, foul breath, Strep. viridans.
Tonsillitis—Strep. non Hæm.
Bronchitis—recurrent attacks.
Goitre—small; tremors, pulse 120, no exophthalmos.
Gastric atony—splash at level of navel at 3 p.m.
Constipation
Glycosuria—intermittent.
Menopausal Psychoneurosis—anxiety type bordering on manic-depressive psychosis.
Albuminuria—slight; indicanuria—both intermittent.

Removal of foci of infection in teeth and tonsils was followed by marked general improvement.

Mrs. D., age 25; no previous illness.

Oral sepsis—extreme—Strep. viridans. Mechanical dentistry five years ago.
Tonsillitis—Strep. Hæm.
Epilepsy—began four years ago.
Endarteritis obliterans—right lower extremity.
Gangrene of foot—amputation of thigh.
Albuminuria—slight—(nephrosis).
Anæmia—slight.

Miscarriage October, 1919, two months previously had pain in calf of right leg with symptoms of intermittent claudication. Says right leg was frozen last winter, which was followed by ulceration and pigmented scars. Scars look suspicious of lues, but no history of it, and Wassermann reaction is negative.

Factors to be considered: (*a*) Lues, freezing of leg, miscarriage, focal infections. Too young for Buerger's disease and not Hebrew. The possible influence of oral infection is at least worthy of consideration.

R. S. N., age 62; lawyer; weight reduced from 176 to 129 lbs. In health, was robust and vigorous, no previous serious illnesses.

Oral sepsis—extreme, complete extraction—patient collapsed and pulseless.
Tonsillar infection—in remains after guillotine operation—S. non. Hæm.
Vesical Claculi—cystitis—operation 1914, intermittent pyuria and phosphaturia.
Myocardial weakness.
Hypotension—S. B. P. 90; D. B. P. 75—varied.
Cholangitis—liver greatly enlarged, recurrent chills, fever, jaundice—1917.
Albuminuria—granular and hyaline casts, pyuria, indicanuria.
Lumbago—very severe and persistent—1918.
Sciatica

After extraction of septic teeth—chills, fever and jaundice disappeared; he regained his weight and returned to duty for over a year. S.B.P. rose to 115 c.mm. Developed tonsillar infection; lumbago and sciatica returned. After tonsillectomy, slowly improved, but overstrained his heart and weakened muscles attempting to climb steep stairway, relapsed and never recovered. Death November, 1919.

Jas. H., age 39; accountant. Under observation, March 28th to August 15th, 1919.

(a) *Oral sepsis*—S. viridans.
(b) *Tonsillitis*—S. viridans.
S. albus.

(c) *Anæmia*—70% Hbn.
(d) *Hæmorrhagic Nephritis*
Albumen 8% bulk.
Phthalein 40 per cent. in 2 hours July 24th. 56 per cent. August 15th.
Non. Prot. Nit. 58 mgms. to 100 c.c.
Micro: red cells, granular casts, leucocytes, etc.
War: negative.

Recovered after clearing up of oral and tonsillar infection.

ONE HUNDRED AND SIXTY CASES OF GOITRE (SIMPLE AND EXOPHTHALMIC) WERE ASSOCIATED WITH THE FOLLOWING:

	Cases	Per Cent.
Oral sepsis	84	52·5
Tonsillitis	75	46·8
Nervous disorders	46	28·7
Rheumatic group: arthritis, fibrositis, myositis, neuritis, lumbago, sciatica	37	23·1
Gastro intestinal disorders including appendicitis gastric and duodenal ulcer	30	18·7
Anæmia	24	15·
Hypertension	22	13·7
Cardio-vascular	16	10·
Eczema	12	7·5
Disorders of the respiratory tract	9	
Indicanuria	7	4·3
Gall Bladder infection and Gall Stones	5	3·1
Nephritis	4	2·5
Diabetes	3	1·8

The association of oral and tonsillar infection as well as certain rheumatic and other conditions with goitre suggests the influence of some common cause. The more frequently two or more diseases occur in the same patient, the more likely they are to be interrelated rather than coincidental.

The tendency to produce a group of local and systemic reactions rather than disease in one organ or tissue may be very commonly observed in cases of oral sepsis.

It would be difficult to select from such clinical groups as those cited any one morbid condition which would represent satisfactorily the diagnosis of the patient's ailment. To get a clear idea of the patient's condition, one must recognize them as multiple, local or systemic, primary or secondary, reactions to infection.

It has been my purpose in this paper:

1. To trace the development of our present conception of disease and its ætiological classification.

2. To show how advancement in medicine has been conditioned by advancement in other branches of science and that our knowledge of morbid processes depends primarily on the stage of development of methods for their investigation.

3. To show that disease represents a reaction to abnormal conditions in environment, in which therefore we search for its causes and through which we exercise our powers to control or modify it.

4. To show that the text-book descriptions of disease, dealing with organs and systems, do not apply accurately to disease as it appears at the bedside, which represents wider defensive reactions.

5. To show that interrelationships in disease and multiple reactions may be expected from the nature of the disease process, which often can be explained only by referring them to a common cause or causes.

6. To illustrate these and clinical diagnosis by examples of reactions to one type of infection, viz: oral infection. I have selected the latter because

(*a*) It represents reactions to conditions often set up artificially.

(*b*) It is common, but until recently, not well understood.

(*c*) It represents a multiple infection of low grade, extending over a long period and unlike typhoid or other acute infections, it does not produce a more or less uniform disease entity of short duration—but a group of allied conditions, not all manifested at one time but perhaps evolving over a period of many years.

In the clinical groups illustrating common disease interrelationships I wish to suggest a viewpoint from which the question may be profitably studied rather than to state as established facts matters which are still debatable.

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HEADACHE OF NASAL PHARYNGEAL AND AURAL ORIGIN

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IN these days of specialism there is a laudable tendency to tighten the bonds that unite the daughter to the mother science. On every hand we see the publication of works destined to show the co-relation between the various branches of medicine and to awaken the interest of representatives of the various specialties for one another's work by defining the lines where their respective provinces meet.

A speciality should not be regarded as a thing apart and a kind of appendage. It should take an active part in all the problems with the solution of which general medicine is concerned. To do this, an active co-operation between general medicine and every one of the various specialities is indispensable. Whenever it is lacking, the speciality is in danger of becoming a mere source of revenue and of losing its scientific significance, while on the other hand, the general practitioner will fail to recognize special symptoms which might have been of the greatest importance to him in the recognition and treatment of his case.

The various intra-nasal conditions which can be the cause of headache have been summarized by Grunwald as follows:

1. Pressure between the nasal septum and the outer nasal wall.
2. Swelling of the nasal mucous membrane causing pressure contact with nerves.
3. Positive and negative pressure within the sinuses.
4. Ulceration of the mucosa causing irritation of nerve endings.
5. Auto-intoxication by re-absorption of purulent exudation.
6. Any condition causing acute congestion of the cranial circulation.

Read at combined meeting of the Section of Medicine with Opthalmology and Oto-Laryngology, December 9th, 1919.

7. The spheno-palatine ganglion syndrome.

It is noted, and its importance is emphasized, that the trifacial nerve supplies with sensation nearly all the structures coming under the consideration of the Oto-Laryngologist. Barnhill (*Laryngoscope*, vol. xxvi., No. 12) speaks of it as the sensory nerve of the nose, throat and ear specialist, in that it supplies the envelopes of the brain, the nasal accessory sinuses, the interior of the nose, jaws, teeth, palate, tonsils and orbit and the skin of the nose, face, forehead, and ear. This nerve with its ganglia and communicating branches from other nerves and ganglia furnishes[3] a difficult field of study because of the great depth within the soft and osseous structures of the head in which these ganglia and communicating nerve branches are situated.

To Sluder of St. Louis we are indebted for many painstaking and elaborate investigations on the various pains in the head due to lesions of the spheno-palatine ganglion and to Pegler, of London, for the publication of his very excellent and elaborate map showing the fifth nerve and its connections. The study of these anatomical researches will facilitate the elucidation of many unexplained phenomena associated with intra-nasal structural changes.

Headaches, due to developmental or acquired structural irregularities within the nasal cavities, while not uncommon, are not so consistently present as some of the members of our speciality, obsessed with operative furore, would have you believe. Fraser, of Edinburgh,[4] very aptly points out that an absolutely even and perpendicular nasal septum is so rare that it must be regarded as an abnormality or rather as being abnormally normal.

When the nasal septum is the cause of headaches or referred pain, it is usually due to a high deflection impinging on the middle turbinal, or a bilateral thickening encroaching on both cribriform slits. The pain in these cases may be due not only to pressure but also to an interference with nasal drainage in the higher nasal meatuses. The presence of spines, spurs, or ridges pressing on the inferior turbinal as a frequent cause of headaches is mentioned so often in literature that one must accept the association while being permitted to doubt, as I do, its frequency. I must confess that I have recollection of very few cases indeed in which there was any actual pressure pain. Rather do I think the associated turbinate turgescence with the impaired air way was the real cause.

Enlargement of the middle turbinal and, by this, I mean either a temporary engorgement or a definite hyperplasia of the tissues covering the bone, may produce pressure on a normally placed septum or may in itself produce pressure on the nerves

supplying the turbinal, *i.e.*, the intra-nasal section of the nasal nerve, a branch of the ophthalmic division of the fifth. This form of irritation, whether it be due to long continued pressure or to the effects of acute inflammation of the mucous and submucous tissues in the nose as is seen in the acute coryzas, may result in pain referred to the tentorium, or to the forehead and upper part of the scalp, and even to the lambdoid suture by way of the supra orbital or to the lower and middle frontal region by way of the supra trochlear.

The middle turbinate may be pressed tightly against even a normal septum, from either enlargement of the bone by over growth or chronic osteitis or by the development of a large cell in its anterior end which ultimately may become cystic.

When the septum is at fault, a high submucous resection may relieve the pains permanently. A partial or timid operation, not only induces no benefit but makes any subsequent procedure a matter of great difficulty, if a permanent perforation is to be avoided. In case the turbinal is the offending structure, amputation of its anterior end is followed by satisfactory results. In no instance is the use of caustic, either chemical or thermal, justified. Acute conditions usually subside by themselves, as is seen in the relief from headache associated with the subsidence of a head cold.

Care should be taken before promising anything definite so far as relief of headache is concerned by this operation, since not always does tight approximation between septum and turbinal result in headache or even sneezing. Too often, I regret to say, are these operations performed for headaches where the simpler and commoner causes are not even sought. I feel sure a little less food (and drink), a little more exercise and a blue pill would have saved many a turbinate and more abnormally normal septi. Not only may the operation fail to relieve the headache not caused by the conditions present, but it may enhance the pain, and discomfort in the frontal region by the formation of adhesions between the septum and the turbinate stump.

The presence of new growths and in this connection one may be permitted to place large nasal polypii, may, if the growth be rapid, produce pain of the pressure type. As an example of this type I might cite the case of a middle-aged lady from whose choanæ I removed a large polypus for headaches over fourteen years ago. The headaches were promptly relieved. Two weeks ago this lady returned to me with a recurrence of her headaches and nasal obstruction. The polypus was found to have recurred and filled her left choanal space. It was again removed and the stalk of the

polypus was seen coming through a large opening in the middle meatus and growing from the maxillary antrum.

The pain from malignant growths involving the maxillary antrum, ethmoidal labyrinth, frontor or sphenoidal sinus is often severe and by its exhausting effects hasten the end. Here, too, one might mention pituitary tumours in which headache is often associated with mental and ocular changes.

It is curious how a partial nasal obstruction will often cause a persistent headache. Some authorities explain this by a vacuum process which is set up in some accessory sinus, others to inefficient aeration of the blood and so some alteration in the vascular interchange between the nose and the base of the anterior part of the skull[5]. At any rate, the feeling of well-being, almost of buoyancy, clearance of the intellect with ability to do much better and more prolonged mental work, which follows the removal of marked nasal obstruction, must be apparent to all of you. The headache of children associated with large masses of adenoids in the nasopharynx is, I think, largely due to the impairment of nasal breathing.

Acute inflammation of any of the nasal accessory sinuses may produce very pronounced head pains, and be relieved either by evacuation of the pent-up secretion or a sudden opening of the ostia permitting the escape of gas. The opening of the ostium may not only relieve the pressure pain if due to distension by permitting the contents whether gas or secretion to escape, but if due to a vacuum cause, relieve it by permitting air to enter.

Time does not permit my taking up each pair of sinuses separately, so I will generalize, and in so doing I am not unmindful how imperfect will be the description.

Acute and chronic sinusitis is much more common than most of us are inclined to think. Among Harke's thirty-seven autopsies of adults in cases of typhoid, pneumonia, influenza, erysipelas and meningitis, nasal suppuration was found no less than thirty-two times (thirty-one times in the accessory nasal sinuses). In all severe acute coryzas you may be assured that some of the accessory cavities take part in the inflammation if they do not cause it. Your understanding of the relationship of accessory sinus suppuration to both nasal discharges and headache will be greatly facilitated if you will look upon the nose as the common duct or outlet of a number of cavities often separately diseased and a diagnosis of independent disease of the mucous membrane of this common duct is never justified till the smallest of the accessory cavities have been with certainty excluded.

Involvement of the frontal sinuses is suggested by severe

frontal headache, appearing often at definite times each day and increased on stooping or leaning forward. Tenderness may be elicited on tapping the forehead above the eyes, but the greatest point of tenderness is situated in the floor of the sinus, its thinnest wall, *i.e.*, in the upper and inner wall of the orbit. Tenderness on pressure in this ana associated with headaches following reading, sewing or other near work is spoken of as Ewing's sign, and is characteristic of a vacuum in the frontal sinus. The so-called supra-orbital neuralgia is nearly always due to acute or chronic frontal sinus disease. Frontal pain may easily mislead us in ascribing the disease to the region where the pain exists, particularly when associated with a severe acute coryza. The following case illustrates the point: A lady, thirty-five years of age, suffering from an acute head cold, was seized with very great pain over the forehead, increased on bending down and excruciatingly tender in the floor of each frontal sinus. A small amount of pus was found after suction high up in both middle meatuses. Trans-illumination of both antra showed each equally bright and clear and both frontal dark I was unable to probe either fronto-nasal canals, and for several days the pain, which appeared at a definite hour each day, was only relieved by morphia or codeia. Intra-nasal measures to shrink up the infundibula region produced little or no effect. The case seemed to be plainly frontal, yet having so little faith in trans-illumination, I decided to irrigate both antra. This liberated a lot of thin yellow pus with complete relief of all frontal pain and a rapid subsidence of the associated coryza. The *x*-ray picture showed not only clear frontals but clear antra.

Suppuration in Highmore's antrum is exceedingly common. With the exception of the sphenoid, this is the only nasal accessory sinus, where the drainage is not at the most dependent part. In chronic cases, with efficient ventilation though badly drained, there is rarely any pain, and even then it is probably due to either absorption of the purulent exudate by the lymphatics which accompany the veins or more probably from the effects of retained pus. One must remember that lymphatic absorption from within this sinus is very small in amount. The acute cases, however, give often very severe pain in the face around the orbit, especially the forehead and in the jaws and teeth. The most tender point will be found inside the cheek in the canine fossa, where the wall may be only of paper thickness.

Pain over the bridge of the nose and about the orbit is often associated with ethmoidal suppuration, especially of the anterior group of cells, that is, those draining below the attachment of the middle concha and into the unciform groove. If the posterior cells

are also involved, deep orbital pain is not uncommon. In fact, orbital cellulitis is nearly always due to ethmoidal infection. The close association existing between the ethmoidal labyrinth, particularly its posterior portion, and the spheno-palatine ganglion at the entrance of the spheno-palatine canal, makes almost any type of pain possible along the course of the fifth nerve.

Sphenoidal suppuration is associated with pain deep between the eyes or in the occipital region. Persistent pain in the top of the head, the occipital or parietal region, always suggests at any rate the exclusion of sphenoidal disease.

There is one symptom or better sign common to nearly all these sinus cases, viz.: a discharge of pus or muco-purulent material within the nose. When present, and oftentimes only as a light streak against a red background in the middle meatus, it may come from the frontal sinus, anterior ethmoidal cells or maxillary antrum; if from the posterior part of the ethmoidal labyrinth or sphenoid, its appearance should be sought for in the olfactory cleft or posteriorly with a rhinoscopic mirror in the spheno-ethmoidal recess from which it flows over the posterior ends of the middle turbinate.

It seems to be very often observed that chronic inflammatory changes in the mucosa of the posterior ethmoidal group and sphenoidal cells is frequently associated with various mental disturbances. Watson Williams[7] reports cases strongly supporting this view. During the late war, I saw an officer about to be invalided to Canada owing to frequent spells of loss of memory, inability to do his work which required sustained mental effort, and deep pain in the centre and back of the head. Immediate and permanent improvement followed evacuation of a chronic bilateral sphenoidal empyema.

The spheno-palatine syndrome is at present very largely in the thoughts of rhinologists. It is not by any means a new discovery, but its clinical importance and the far-reaching manifestations of its irritative phenomena are being more closely studied.

Sluder's[8] description is as follows: The pain begins at the root of the nose, extending to the upper jaw and at times to the lower, backward into the ear and mastoid and thence to the shoulder, arm and hand. When the cause is confined to the ganglia, and not secondary to sphenoidal or ethmoidal disease, there will usually be an inequality of the two sides of the soft palate, the arch of the affected side being higher, the uvula and median raphe being drawn to the affected side, where a partial anæsthesia is present. Loss of taste on the affected side may also occur. He also says that

many times he has, temporarily at any rate, relieved pain of the greatest severity by the application of cocaine to the orifice of the spheno-palatine foramen, and has made a great many injections into the pterygoid fossa with alcohol and carbolic to relieve intractable neuralgia of the fifth nerve.

In asking a rhinologist to say as to the cause of any headache being in the nose, I appeal to you to appreciate more than I think some of you do, the very great difficulty in giving a decided answer. A negative finding on *one* examination is not sufficient. Repeated and prolonged investigation may be necessary. Even certain operative measures may be essential. These may be the beginning of a cure worse than the disease or at any rate a procedure or interference greater than the gravity of the symptoms we hope to relieve. Brücke[9] insists on the responsibility we assume when advising nasal operations, when we must know that patients suffering from chronic nasal disease are often neurasthenics or hypochondriacs and readily resign themselves to the small inconvenience of their sufferings if you assure them that they have not any dangerous disease, or that there is no disposition to tubercle, cancer, etc.

In the naso-pharynx we may find the cause of a headache in a large mass of adenoids, in a nasal fibroma, or a gumma, or the pharyngeal manifestations of secondary syphilis, while in the teeth a headache may be result of sepsis associated with dental caries.

The facial or palatine tonsils may be the cause of a headache, but practically only from the results of septic absorption on the general health. If the teeth and tonsils take any very great part in the causation of headaches, the citizens of this continent will soon be immune.

Headaches due to aural conditions have not been associated with the discussion to-night. Assuming this was an oversight, permit me, Mr. President and gentlemen, to very briefly consider it.

The intense pain in the side of the head and ear due to acute middle ear inflammation, which in children may cause symptoms of meningeal irritation, is familiar to you all. We must not ignore or forget, as the patient never will, the small boil or furuncle found in the external auditory canal, producing severe frontal occipital or parital pain or the impacted cerumen suddenly swollen by bathing.

The presence of mastoid involvement in acute middle ear suppuration with pain radiating over the side of the head is simply the same pain as in acute otitis media now increased in intensity owing to involvement of the adjacent part of the middle ear tract.

This pain elicited in its most intense phase by pressure over the mastoid antrum, must be differentiated from that having its greatest and only tender point one inch behind the mastoid, seen in the spheno-palatine syndrome.

When we have an extra dural or peri-sinus abscess associated with the acute or chronic aural infection, we have more severe pain, deeper in the head, at times septic temperature with chills, or, if meningeal involvement, added symptoms of this are present. The pain due to caries of the mastoid in chronic middle ear suppuration is usually deep in the mastoid, periodical in character and not necessarily accompanied by any external swelling or tenderness. Intra-cranial involvement producing pain simply means the presence of a brain abscess either in the temporo-sphenoidal or cerebeller area. This may or may not be accompanied by slow pulse, vomiting, paralysis, vertigo or nystagmus. In fact, a collection of pus may be situated within the brain for years and produce no symptoms whatever, and it is not alone in the silent frontal lobe that this may occur. Pain in the head in chronic middle ear suppuration relieved by a free aural discharge points to a deep seated collection, the exit for which has been temporarily blocked.

Many headaches due to intra-cranial lesions are associated with vertigo and nystagmus. Permit me to remind you that vertigo[10] always means labyrinthine irritation, and the examination of the vestibular apparatus should invariably be carried out.

Gentlemen, I have said so much regarding headaches from the oto-laryngologist point of view that some of you may think that, as with specialists generally, I see all the ills produced in the body as emanating from the particular organs with which I am most concerned. I hope my horizon is not so restricted. I ask for your kindly consideration for the enthusiasm of youth, and your help to find the solution of many of our difficult problems by more frequent meetings and interchange of ideas.

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REPORT OF FIFTY-EIGHT CASES OF DELAYED ARSENICAL POISONING FOLLOWING THE ADMINISTRATION OF "606" PREPARATIONS

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Introduction

DURING the past eighteen months there have been numerous reports of cases of poisoning following the administration of "606" preparations. These reports have described only single, or at most a few, cases. We have had the opportunity of seeing a large number of such cases and the purpose of this paper is to draw attention to their prevalence and the variety of the symptoms which may occur.

The series reported below were all seen in military hospitals, but during the last four months several additional cases have come under our observation in civil practice.

The idea that syphilis should be treated in its early stages by free administration of salvarsan, or neo-salvarsan, was supported by the results of this treatment as shown in the rapid disappearance of symptoms, the freedom from relapses and the negative reactions readily obtained to the Wassermann test. This led the army medical authorities to adopt the "intensive treatment", *i.e.*, doses of salvarsan and mercury, administered once a week for seven or eight weeks, followed by a further course a few months

later, and, if the Wassermann test was subsequently positive, a third course. It was recommended that the doses of salvarsan should be small at first until the degree of a patient's susceptibility to arsenic was found. One grain doses of mercury were advised. Instructions were issued that a physical examination, including tests for albuminuria, should be made before and after each treatment. Medical officers were warned to watch carefully for signs of arsenical and mercurial poisoning. Once a patient was considered non-infective, he was sent to his lines or barracks and the treatment continued at the venereal disease treatment centre of his district. By this method a patient received efficient treatment with a minimum loss of time from his duties. The day after a treatment he was "excused duty" or given "light duty", but by the third or fourth day he was usually at "full duty" again. The plan worked successfully until the autumn of 1917, when several deaths occurred of men who had received treatment in the preceding three months. This led to an immediate and thorough investigation by the army medical authorities in England, and it was found that nearly all fatal cases had been treated in one of five "centres". Investigation of these centres showed that instructions had not been carefully followed, that in some cases patients had received repeated doses after symptoms of arsenical poisoning appeared, and that a proper physical and urinary examination had been omitted before giving these treatments.

In January and February, 1918, Captain Smith observed several fatal cases at No. 14 Canadian General Hospital and reported them at a meeting of the Eastbourne Military Medical Society. Lieutenant-Colonel Strathy took charge of the medical division of this hospital in March, 1918, and together they observed eight fatal cases. Following on these, the remaining fifty cases of the series came under our observation. The military authorities transferred Lieutenant-Colonel Strathy to No. 16 Canadian General Hospital in August, 1918, thus leaving Captain Smith to carry on this work at No. 14 Canadian General Hospital. Influenzal-pneumonia caused the death of Captain Smith in October, 1918, and unfortunately most of his records were lost, so that some of the earlier cases can only be incompletely recorded.

It is regretted that, owing to service conditions, we were unable to follow all cases as long as could be desired. The pressure of work in 1918 and 1919 made it impossible to investigate the cases as thoroughly as we would wish. Lieutenant-Colonel Strathy was ordered back to Canada in June, 1919, leaving further obser-

vation of the cases to Captain Hannah. The assistance of Captain C. V. Bailey was obtained towards the end of the investigation to study the liver changes from the chemical aspect. It is hoped that he may be able to add further information about the cases in the near future. The delay in publishing this paper is partly due to the fact that the Salvarsan Committee of the Medical Research Committee, England, had all our clinical data from June to September, 1919, for the purpose of including them in their report on salvarsan poisoning.

Fifty-eight cases are here reported. Eight of these were fatal, being the first of the series to come under observation. The remaining fifty cases made a slow but otherwise satisfactory convalescence.

Symptomatology

Eight cases were sudden in onset and extremely severe, and died within a few days. The remaining patients varied in the degree of their severity, but the onset was more gradual and all left the hospital almost fully recovered. Therefore we have divided the series as follows: (1) Fatal cases; (2) non-fatal cases.

Group I.—Fatal Cases

In these cases the greatest number of doses of salvarsan given was eleven, the least four. The greatest amount of salvarsan administered, where it was possible to obtain records, was 6·95 grams, the least amount 2·2 grams. The average time of onset of symptoms after the last dose was forty-one days, the longest interval forty-eight days, the shortest eighteen days. One patient was under twenty years of age, four between twenty and thirty years, and three between thirty and forty years of age. The smallest number of days which elapsed between the onset of symptoms and death was two, the greatest eleven, the average five days.

The symptoms in every case were similar. The jaundice of onset was rapidly followed by nausea, epigastric pain, stupor, hæmatemesis, delirium and death. A typical case is here reported:

Private R., age twenty-one, eighteen months before admission had had a slight sore on his penis. He did not report it and was not treated at the time. He had had five attacks of gonorrhœa in the previous two years. While under treatment for gonorrhœa in November, 1917, his blood was tested and showed a positive Wassermann reaction. In December, 1917, and January, 1918,

he was given seven doses (4·7 grams) of novarsenobillon and seven one-grain doses of intramuscular mercury. Following this he was on light duty but lacked strength and energy. On March 2nd he felt nauseated and chilly. March 3rd he vomited several times. March 5th he noticed he was jaundiced, and his vomiting persisted so that he could not retain solid or liquid food. The vomitus became black. He was so weak he could not sit up. March 6th he was admitted to hospital.

On admission, 11 a.m., he was rational but drowsy. He vomited frequently. The vomitus was black and looked like hæmolyzed blood. There were no clots. The tongue was furred and the breath foul. His face was cyanosed. Breathing somewhat stertorous. Temperature, 98·3°; pulse, 99; respiration, 32. Abdomen slightly distended. Liver palpable just below costal margin. Spleen appeared large on percussion, but was not palpable, probably on account of abdominal distension. Examination of heart and lungs—negative. Gonococci present in urethral smear. Leucocyte count, 34,000 per c.mm. Differential count—polymorphs, 80 per cent.; lymphocytes, 16 per cent.; large mononuclears, 4 per cent. Urine—amber colour, acid, specific gravity 1020, sugar absent, albumen present ++, microscopically pus cells and red blood cells, no casts. During the day he vomited more than a quart of the black material and some bright red blood. His pulse became weaker, the cyanosis was more marked, but he remained conscious until a few minutes before death which occurred at 9 p.m.

Death in all cases but one followed rapidly. Four of the patients were wildly delirious. In the case of the patient who lived for eleven days after admission, drowsiness came on gradually and slowly deepened until death. In all cases tested the urine contained bile, and in nearly all cases albumen as well. The blood picture was not characteristic. The hæmaglobin and red cells were not much reduced. The leucocytes varied in number from 14,000 to 34,000 per c.mm. and the polymorphonuclear leucocytes varied from 50 per cent. to 80 per cent.

Group II.—Non-Fatal Cases

The greatest number of doses of "606" given was fourteen-the least two. The records showing quantities of "606" adminis, tered were not always available. The average time of onset of symptoms was forty-five days, the longest interval one hundred

and eighty days, the shortest three days Three patients were under twenty years of age, thirty between twenty and thirty years, and seventeen between thirty and fifty.

Thirty-nine of the patients were admitted for jaundice, eight for dermatitis, two for nephritis and one for general debility. Jaundice followed dermatitis in one patient, and two other cases of dermatitis were followed by peripheral neuritis.

Coated tongue, poor appetite, epigastric distress, abdominal distension, headache, general malaise, and loss of weight were noted throughout the group. The blood pressure was recorded weekly in all cases. During the early stages the systolic pressure was frequently below normal. It was often normal and never over 140 mm. As the patient's condition improved, the blood pressure returned to normal. A routine urinalysis was carried out every few days with the following results: albuminuria, twenty-eight cases; bile salts present, thirty-five cases; increased urobilin and urobilinogen in sixteen cases; leucin and tyrosin never found. The microscopical findings did not show any change of interest. A Wassermann test was obtained in the later cases before they left the hospital. All gave a negative reaction, with two exceptions. These two remained strongly positive.

Jaundice. This was the most prominent symptom noted throughout the series, being present in all of the fatal group and thirty-nine cases of the non-fatal group. It appeared within ten days of the onset of toxic symptoms and lasted on an average for four weeks. In one case the jaundice was noticeable at the time of the patient's transfer to Canada, five months after its first appearance. Itching of the skin was never present. A marked tendency to somnolence manifested itself, disappearing with the decrease in icterus. The liver was distinctly enlarged in a number of cases, slowly returning to normal size, but never very tender on palpation. The condition of atrophy of the liver in the early stages and following at a later stage on hypertrophy, is discussed below under *x*-ray examination. The appetite usually continued small for about two weeks. When this returned, there still remained for some days, and in some cases for several weeks, diminished digestive power with a feeling of heaviness and distension in the epigastrium when food was taken.

In the worst cases of this type there was a period of several days in which the secretion of bile was low, evidenced by lack of jaundice, absence of bile in the urine and clay-coloured stools. A marked feature of these cases was the slowness with which they

returned to normal. The average duration of hospital treatment was from two to three months.

The following case is an example of the slow return of bile secretion and liver function:

Private B., age twenty-nine, had received 2·3 grams of galyl in six doses and 8 grains mercury in oil. Fifty days after his last treatment he developed headache, epigastric pain, jaundice, œdema of hands and face, and diarrhœa.

Examination showed liver and spleen palpable, and large traces of albumen and bile in the urine. Stools showed bile pigment. The blood picture was normal. Blood pressure, 90 diastolic, 140 systolic.

He was put on a daily diet of milk forty ounces, and sugar two ounces, with bicarbonate of soda, grains xlv. Water was given freely.

A week later the jaundice was deeper, the œdema had disappeared. There was little or no loss of weight, no vomiting or diarrhœa. The liver dulness had become less, the spleen was still palpable and the stools were clay coloured.

A week later the jaundice was less, the liver dulness on percussion was markedly decreased. (At this stage we had not commenced examining the liver by *x*-ray.) The albumen had disappeared from the urine, but there was still a faint trace of bile. The blood count remained normal.

Later the jaundice entirely disappeared, but the stools remained clay coloured and his digestive powers low. His liver was apparently much atrophied, but he was quite comfortable as long as he was kept on the low diet mentioned. Any increase of diet caused epigastric pain and discomfort. Apparently little or no bile was being formed in the much damaged liver. Convalescence lasted over six months but recovery was apparently complete.

Dermatitis. Eight cases of dermatitis following "606" were admitted to No. 16 Canadian General Hospital between March and June, 1919. While dermatitis was the most prominent manifestation, gastric disturbances, congestion of the mucous membranes, loss of weight and general weakness were also present. Liver changes similar to those occurring in the jaundice cases manifested themselves at some time during the illness. The average time for the appearance of this skin condition was within two weeks following the course of salvarsan.

It began as a patchy, papulo-erythematous eruption, spreading until confluent, and until the whole skin was a crimson colour and

slightly infiltrated. A few days later desquamation commenced, lasting several weeks. The scales were large, thick, abundant and without any exudation beneath them. As the exfoliation decreased, the infiltration and brown pigmentation of the skin increased, especially over the abdomen and extremities. Four of the cases developed numerous superficial abscesses with elevated temperature extending over a period of from three to five weeks. A peculiar condition of the toe and finger nails was observed in these cases. They became pitted and thickened, followed by splitting and shedding of the nails and eventually new ones replaced them. The hair of the scalp, axillæ and pubes fell out, but was gradually growing again at the time the patients left the hospital. A typical case is described below:

Driver S., aged thirty-seven years, developed a sore on the penis December 15th, 1918. Between 17–2–19 and 30–3–19 he was given five doses of neo-salvarsan intravenously and five grains of mercury intramuscularly. On the latter date an irritating red rash appeared on the neck and arms. He was given a further dose of both neo-salvarsan and mercury. The rash became more severe and exfoliation followed a few days later. The urine showed albumen.

He was evacuated to England and admitted to No. 16 Canadian General Hospital on 10–4–19.

On admission he complained of severe irritation of the skin and conjunctivæ. Exfoliation of the skin was very marked, the conjunctivæ were reddened and his hair was falling out rapidly. Stomatitis was marked. He had no gastric symptoms. Temperature, 102° Liver was palpable. Hæmoglobin, 85 per cent. Red blood cells, 5,800,000 per c.mm White blood cells, 17,000 per c.mm. Differential count showed a slight increase in the polymorphonuclear cells. Blood pressure, diastolic 70; systolic 114. On 16–4–19 three large superficial abscesses were present; these were opened. On 25–4–19, liver and spleen were palpable. Skin showed slight brown pigmentation No bile or albumen in urine. By 5–5–19 several more abscesses had developed. Liver and spleen stil palpable. Urine showed no albumen or bile. After this he steadily improved.

Peripheral neuritis. In two cases of this group, peripheral neuritis occurred. They were both admitted for "exfoliative dermatitis" and developed neuritic symptoms several weeks later.

Private P., aged twenty-five years, was admitted to No. 16 Canadian General Hospital on 16–4–19. Sore had developed on

penis 27–12–18. He had received seven doses of "606" and six injections of mercury. A papular eruption, followed by desquamation, appeared on his body after the fifth injection. Four months after treatment he began to complain of weakness and some numbness in the lower extremities. This condition grew worse. 26–6–19, examination showed marked weakness of upper and lower extremities, with toe drop and wrist drop. Some decreased sensation in hands and feet. Deep reflexes absent. He was unable to feed or dress himself. Two months after the onset of neuritis he was invalided to Canada. At this time he had slightly improved. Deep reflexes were still absent. He was beginning to feed himself, but was unable to walk. Sensory changes had disappeared.

A Case of Arsenical Poisoning due to Fowler's Solution

A condition very similar to poisoning following "606" was found in a patient suffering from arsenical poisoning after the administration of Fowler's solution for psoriasis.

Sergeant F., aged thirty-five, admitted to hospital 24–2–19, had enjoyed good health previously, but had had psoriasis for fifteen years. Five months previous to admission he commenced taking Fowler's solution, minims v three times a day, and except for short intervals, had taken this dose until admission. A month previously he had noticed that the skin of his body and extremities was becoming dark. He had lost forty pounds in weight, sleep was restless and appetite very poor.

Examination showed nigger brown pigmentation of the skin over all of the body, except the head, hands and feet, and most marked on abdomen, back, thighs and perineum, with fine bran-like desquamation. Heart and lungs were normal. Blood pressure normal. Liver showed atrophy both on percussion and by *x*-ray. The height of the liver shadow in the right parasternal line in over fifty normal patients was not less than six inches, whereas in this patient it was four and three-quarter inches. Spleen not enlarged. Urine showed no bile or albumen. He was rested for a month and given milk diet.

31–3–19. Gaining weight and strength. Appetite improved. No change in pigmentation.

7–4–19. Appetite good Stools normal.

8–5–19. Feels quite well. Full diet. Liver almost normal size, six and a quarter inches deep in parasternal line.

This patient, evidently very susceptible to arsenic, developed

a chronic dermatitis and atrophied liver from the administration of only 15/100 grain of arsenious acid daily. His symptoms referable to the liver were almost identical with those of patients who received slavarsan or neo-salvarsan.

Additional Cases

The month of August, 1919, brought many convalescent patients to England from the hospital centres in France, for immediate transfer to Canada. At No. 16 Canadian General Hospital we observed eleven more cases of "606" poisoning which are not reported in the above series. Time did not permit us to investigate them thoroughly, but they readily grouped themselves according to their outstanding features, as follows: Jaundice, seven cases; dermatitis, three; general debility, one.

Post-Mortem Findings

As the post-mortem examinations showed very similar conditions in all cases, the autopsy report of Private R., whose case is described above, is given as typical.

Autopsy fourteen hours after death. Body well developed and well nourished. Well marked icterus of skin and conjunctivæ. Body fat is tinged with jaundice. No free fluid in the peritoneal cavity. Many hæmorrhagic spots about the size of a sixpence in the mesentery. Right pleura contained about 50 c.c. of straw-coloured fluid. Few old adhesions at left apex. The pericardium was normal. Lungs crepitant throughout. Bloody frothy fluid flowed from bronchi. Some hypostasis. Heart muscle pale, otherwise normal. Stomach filled with black, unclotted, hæmolyzed blood. Mucosa shows considerable digestion but no ulcers or bleeding points found. Duodenum and jejunum contain black blood similar to that found in stomach. Intestines otherwise normal in appearance. Œsophagus, suprarenals and pancreas normal. Spleen slightly larger than normal, on section almost diffluent. Liver considerably smaller than normal, capsule wrinkled, on section pale with nutmeg appearance, friability about normal. Gall-bladder contained 5 c.c. of normal looking bile. Kidneys larger than normal, on section very pale, stellate veins congested, cortex swollen, considerable amount of fat in pelves, capsule strips with difficulty.

Meninges slightly congested. Brain appears normal

Anatomical diagnosis: (1) Acute atrophy and degeneration

of liver. (2) Slight chronic nephritis and acute cloudy swelling. (3) Mesenteric hæmorrhages. (4) Beginning myocardial degeneration.

Microscopic examination showed marked damage of the parenchyma of liver and kidneys. The liver lobules were almost unrecognizable due to the great reduction of liver cords, and where liver cords remained they were remarkably degenerated. The central vein of the lobule was seen supported by the fibrous reticulum. The lobule and Glisson's capsule were infiltrated with round and polymorphonuclear cells. Degeneration and desquamation of the epithelium of the higher tubules was found in the kidneys.

Just before submitting this paper for publication, we had the opportunity of seeing an autopsy on a demobilized soldier who died following anti-syphilitic treatment. His history was very similar to the cases in our fatal group, except that he had received only two grains of mercury but 5·85 grams of "606". The liver on section had the appearance which is usually seen in acute yellow atrophy, the cut surface being of a yellowish brown colour, with numerous elevated areas of a deep red. Microscopically—degenerating liver cords were seen in the damaged liver lobules.

Ætiology.

Nearly all observers of "606" poisoning have concluded that the benzol group in the "606" is the cause of the poisoning. With this we entirely disagree, as we believe that the cases are typical of delayed arsenical poisoning. It is well known that arsenic attacks the liver, stomach, skin and nerves. These were the main organs of the body affected in the series we are reporting. The symptoms in the case of arsenical poisoning following the administration of Fowler's solution are almost identical with the cases following "606".

It is apparent from the cases reported that age and syphilis are not causative factors. It occurred in all army ages, in all stages of syphilis and in patients who had never had syphilis. The direct cause of the symptoms is poisoning of the liver, skin, stomach, and kidneys by arsenic. One patient had previously had a wound of the liver which possibly was a predisposing cause and led to the diagnosis of abscess of the liver. The abdomen was opened which probably hastened death. One patient gave a history of an attack of jaundice five years previously. Three of the fatal cases had gonorrhœa at the time of death. In Dr. Wallace Wilson's fatal case, mentioned below, gonorrhœa was also present. One was

alcoholic and had chronic nephritis. One had had nephritis six months previously. And one at autopsy showed a gummous mass as large as a tangerine under the diaphragm. It was composed of brownish material. It is not certain whether this was a pre-existing condition or was due to the breaking down of the liver from arsenic. No particulars of previous history were available.

It is notable that all fatal cases but one occurred between November, 1917, and March, 1918. Routine urinary and physical examinations were then insisted upon before each administration of "606" and mercury, in all venereal centres.

Preparations employed. None of the cases were treated with the original German preparations, but occasional reports of similar cases are published in the recent German literature. Nearly all the patients were treated with substitutes for neo-salvarsan, not salvarsan. Some of the patients were given neokharsivan, some galyl and some novarsenobillon. As there are no records obtainable as to which of these preparations was most commonly used, and as we were not able to find records in all cases of the preparations which the patients received, it is not thought that anything would be gained by giving data as to which preparation was given in our cases. The cause of the poisoning was apparently more a matter of injudicious dosage and lack of physical and urinary examination, than of the particular preparation used.

The Salvarsan Committee of the Medical Research Committee have investigated the various preparations very thoroughly, and where fatalities have occurred, they have tested capsules of the drug from the batch prepared at the same time. Their report will deal with this part of the problem much more thoroughly than we can attempt to do. Our impression is that it is the administration and not the preparation or composition of the drug which is at fault.

In all cases, intramuscular injections of mercury were given at the same time as the arsenical treatment. A few of the patients showed slight symptoms of mercurial poisoning, but mercury is known to be an irritant of the kidneys and in excessive doses to cause degeneration of the tubular epithelium, and it seems not at all unlikely that for this reason it acted as a predisposing factor. If the kidneys were damaged by the mercury, the elimination of the arsenic would be delayed. There is no evidence that mercury has a toxic action on the liver.

Arsenic is stored principally by the liver and is also toxic to the kidneys. It is excreted by the kidneys and also largely by the skin.

We believe that the combination of "intensive treatment" by mercury and "606" probably favours the occurrence of arsenical poisoning more than when arsenic and mercury are administered in separate courses. Whether the therapeutic benefits of the simultaneous treatment outweighs these dangers we are not prepared to judge. Since returning to civil practice, we have seen several cases of mild jaundice and slight atrophy of the liver. These are all that have occurred in some hundreds of cases where arsenic and mercury have been administered in separate courses. Dr. Wallace Wilson, of Vancouver, has furnished us with the history of a patient who died in Vancouver three months after a combined course of six novarsenobillon and six mercurial treatments.

Fatalities would probably be avoided in all cases if the patient were examined carefully before and after the treatment, and dermatitis, albuminuria and bile in the urine excluded. Where possible, the liver should be screened at the end of each course, as atrophy can sometimes be diagnosed by this method before any other symptoms appear. The following case illustrates how atrophy of the liver may precede the jaundice.

Private L., age forty-two, was admitted to hospital, 20–2–19, convalescent after influenza. He gave a history of seven doses of "606" and seven doses of intramuscular mercury in December and January, so his liver was examined by *x*-ray screen 24–2–19. The liver was seen to be almost entirely to the right of the middle line, the angle formed by the junction of the liver and vertebral shadows was acute, the upper surface of the liver was more dome-shaped than normal. Atrophy of the liver was diagnosed and against the patient's wishes he was put on a much reduced diet. He did not see why this should be done, as except for slow convalescence from influenza he had no complaints. He felt better and at his own request he was given two weeks sick leave and discharged from hospital on 12–3–19. While on leave he ate freely for the first few days, then he lost his appetite and on 26–2–19 he became jaundiced for the first time and returned to hospital. His liver showed marked atrophy. He was put on the reduced diet again, and by 30–5–19 his appetite had returned, his jaundice had disappeared and the liver had almost regained its normal size.

Prognosis

Where the onset is sudden with stupor and vomiting, death supervenes in a few days. Where the onset is gradual and no symptoms follow within a month of "606" treatment, the outlook is

good but recovery is slow. The appetite returns quickly but the power of digestion is usually poor for some weeks. In some cases, patients were unable to take ordinary diet without discomfort for two or three months. Being soldiers, suggestion may partly account for this. A not unusual feature of the early stage of recovery is the apparent absence or great reduction of bile formation. No bile is found in the urine, the stools are clay coloured, and there is no jaundice.

Treatment

As the nature of the first four cases was not understood, no systematic treatment was tried. Purgatives were given. Vomiting was so severe that no food was retained. Morphia had to be given to control mania where it was present. Later it was thought that acidosis was a factor. Bicarbonate of soda was given, but the cases were rapidly fatal.

In the milder cases the diet was much restricted as it was thought that the power of digestion was limited, and under these conditions toxic substances might be formed from food which could not be assimilated. Each patient was given thirty ounces of skimmed milk and two ounces of sugar daily. As they improved, two ounces of jam and a slice of bread were added The diet was intentionally high in carbohydrates and low in fat to aid in combatting acidosis. Tea and water given freely allayed the hunger to some extent. Gradually the diet was increased. Absolute rest in bed was ordered. Sodi bicarb. drams ii, in twenty-four hours were given Except in the fatal cases, vomiting ceased when a small diet was given. Loss of weight was slight.

Prophylactic Treatment

After the cause of the jaundice outbreak was recognized as due to "606" treatment, the cases were carefully investigated by the army authorities, and all intravenous treatment with "606" was discontinued for a few weeks. It was thought that infection might be the cause of the trouble. All the centres which had treated the cases were investigated and a common factor looked for. While the aseptic technique in some centres was found to be not perfect, in others there was no fault in technique. It was then found that the infected patients had never had a proper urinary or physical examination made before receiving repeated doses. The order was then repeated that an examination of urine must be made the day after "606" treatment and before each treatment. Signs of

arsenic dermatitis were to be looked for in all cases. After this routine had been rigidly enforced, no fatal cases were seen by us.

From observing the patients closely it was found that moderate damage to the liver caused no appreciable symptoms, but when the damage became greater, loss of appetite and then jaundice appeared. If the diet was still free, the damage to the liver still progressing, severe symptoms developed rapidly, leading to death in a few days. If, however, the diet was kept at a minimum, severe symptoms did not follow. It would therefore appear that the severe symptoms of the fatal cases were due to the inability of the liver to handle the products of digestion carried to it and death ensued from the poisoning of the body by these products When patients had only been a few days on the low diet, an increase in the symptoms, especially epigastric discomfort, was always produced by increased diet. The patients soon learned this themselves, and though at first inclined to take, surreptitiously, diet not ordered for them, they soon found that it caused them so much discomfort that they were satisfied to remain on the low diet ordered.

Examination of the Liver by *X*-rays

One of the most interesting facts brought out by the observation of these patients was the changes in the appearance of the liver shadow as shown by *x*-rays. Outlining the liver by percussion is of doubtful value, as it is impossible to be sure of its accuracy. Therefore, use was made of the *x*-ray fluorescent screen in determining the size of the liver in the last thirty cases under observation. A large number of normal cases were examined in order to discover the normal location and outlines of the liver. All patients were examined standing. The level of the upper border of the liver was marked on the patient's skin and then the lower border marked. Both markings were made at the end of an ordinary expiration. This revealed the fact that atrophy of the liver was common in the cases of arsenical poisoning but was found in two other patients only. These two patients were both cases of so-called catarrhal jaundice of long standing. It was found that besides the decrease in the depth of the liver shadow, atrophy showed itself by changes in the shape and position of the liver. The angle formed by the junction of the liver and vertebral shadows was frequently acute instead of a right angle as in normal cases. The liver tended to be displaced to the right and downwards, very little of the liver being to the left of the middle line of the body. The relaxed capsule permitted the upper surface of the liver to be drawn up into a more

dome shaped outline by the elastic traction of the lung, and the lower border of the liver approached the vertical more nearly than in the normal. In one case of atrophic cirrhosis, the liver being rigid, although atrophied, the change in the shape of the upper surface was not seen.

Summary

1. Fifty-eight cases of delayed poisoning following administration of "606" and mercury were observed. Forty-seven of these showed symptoms referable to the liver, namely: jaundice, decreased digestive power and liver atrophy. Eight of these were fatal and at autopsy showed marked atrophy of the liver. Atrophy of the liver may be marked in cases which ultimately recover. This condition can be diagnosed by *x*-rays.

2. Dermatitis occurred in eight cases. Five were severe with marked exfoliation.

3. Peripheral neuritis was observed in two cases.

4. Albuminuria was present in over 50 per cent. of the cases. Œdema was found in two cases.

5. The onset of the symptoms seldom occurred until five weeks after the administration of "606" had ceased.

6. The earliest symptoms of "606" poisoning of the liver were, bile in the urine, albuminuria, loss of appetite and jaundice. These symptoms should be looked for in all patients receiving "606" treatment, and on their appearance the administration of "606" should cease.

7. By *x*-ray examination, atrophy of the liver may be diagnosed at an early stage.

8. Where evidence of liver damage is present, the diet should be reduced to a minimum.

9. Dermatitis with atrophy of the liver occurred in one patient who received arsenic in the form of Fowler's solution, minims v. t.i.d. for five months.

10. We believe these were cases of delayed arsenical poisoning.

We are indebted to Honorary Captain Lachlan Gilchrist, C.A.M.C., for much help in the examination of the liver by *x*-rays, and to Captain James H. Howell, C.A.M.C., who was in charge of the jaundice wards at No. 16 Canadian General Hospital for several months, for his painstaking work on the cases, and for keeping accurate records, and to Captain H. B. Hetherington, pathologist, No. 14 Canadian General Hospital, who performed the autopsies on our fatal cases.

SUMMARY OF FATAL CASES WITH POST-MORTEM FINDINGS

No.	Name	Age	Stage of Syphilis	Treatment	Previous History	Time of onset after treatment	Duration of illness	Post-Mortem-Findings
1	E. H.	About 20	Primary	606 7 grams Mercury 7 grains	Nephritis 6 months previous	Less than a month	11 days	(1) Pericardial and mesenteric hæmorrhages. (2) Liver weight 32 ozs. Semi-fluid. (3) Spleen small. (4) 200 c.c. dark blood in stomach. (5) Subacute nephritis.
2	Pte. J. S.	21	Primary	10 doses 4 grains Kharsivan and 10 grains Mercury	Recent G.W.S. Old wound of liver Old right side pleurisy.	70 days	3 days	(1) Peritoneal hæmorrhages. (2) Old right pleurisy. (3) Atrophy of liver. (4) Degeneration of kidneys. (5) Spleen enlarged. (6) Hæmorrhages from stomach.
3	Cpl. G. D.	19	Secondary	2·2 grains Kharsivan, 5 doses. 8 grains. Hg. and some KI		3 days	4 days	(1) Small mesentric, sub-pericardial and subpleuritic hæmorrhages. (2) Liver weight 32 ozs. (3) Spleen weight 8 ozs. (4) Gastric hæmorrhages.

SUMMARY OF FATAL CASES WITH POST-MORTEM FINDINGS

No.	Name	Age	Stage of Syphilis	Treatment	Previous History	Time of onset after treatment	Duration of illness	Post-Mortem Findings
4	Sgt. O. H.	23	Doubtful history Wass. +	11 doses N. A. B. Hg. 9 grains.	Multiple flesh wounds 10 months previous. Gonorrhœa 5 months previous.	40 days	2 days	(1) Petechial hæmorrhage skin of neck. Mesenteric hæmorrhages. Pleural hæmorrhage. (2) Blood in stomach + + + . (3) Mass size of walnut in tail of pancreas, containing black, mucilaginous matter, (?) old blood. (4) Liver about one-third normal size. Fibrous. (5) Congestion of ileum with film coating it. (6) Spleen not enlarged.
5	Pte. J. A. G.	37	Primary	9 doses N. A. B., 5·85 grains 8 grains Hg. 8 doses.	Alcoholic. Has gonorrhœa. Chronic nephritis.	6 days	2 days	(1) Mesenteric hæmorrhages. (2) Spleen enlarged and diffluent. (3) Kidneys—slight chronic nephritis. (4) Hæmorrhage under capsule of pancreas. (5) Pericardial hæmorrhages. (6) A pint of hæmolyzed blood in stomach. (7) Intestines contain blood. (8) Liver normal size. Nutmeg appearance due to degeneration of parenchyma. Less friable than normal. (9) Broncho-pneumonia.

SUMMARY OF FATAL CASES WITH POST-MORTEM FINDINGS

No.	Name	Age	Stage of Syphilis	Treatment	Previous History	Time of onset after treatment	Duration of illness	Post Mortem Findings
6	Pte. J. H. R.	21	Latent for 14 years.	7 doses N. A. B. 4·7 grains. 7 grains Hg. 7 doses.	5 attacks gonorrhœa in two years. Slight healed T. B. right lung. Slight chronic nephritis. Heart slightly enlarged and degenerated.	37 days	13 days	(1) Hæmorrhage in mesentery. (2) Old adhesions, left apex. (3) Liver smaller than normal. (4) Spleen enlarged and diffluent. (5) Kidneys enlarged. (6) Slight chronic nephritis. (7) Blood in stomach. (8) Slight myocardial degeneration of heart.
7	Pte. W. C. R.	38	Latent for 18 years.	9 doses N. A. B. 4·65 grains. 7 grains Hg. 7 doses.	Slight flesh wound 3 months previous. Old pleurisy right side.	35 days.	13 days.	(1) Mesenteric and pericardial hæmorrhages. (2) Liver two-thirds normal size. Nutmeg appearance. Fibrous. (3) Spleen small and diffluent. (4) Small hæmorrhages under kidney capsule and under pancreas. (5) Blood in stomach.
8	Pte. J. S.	No record	No record	Has had intensive treatment, no particulars available.	No history except hæmatemesis.	No record	No record	Parechymatous degeneration of liver, also kidneys. Superficial erosions of stomach.

LESSONS FROM WAR SURGERY

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I WAS considerably surprised when the secretary informed me that my name was on the programme of this meeting, and that I was to say something on the development of surgery during the war. One feels that so much has been written on war surgery during the past five years, that there is very little that one can say that will be at all interesting from the standpoint of its being new to anyone here. However, as I had no choice in the matter, I would claim your indulgence for a few minutes, while I briefly indicate a few lines along which important advances have been made.

Military surgery has been defined as the application of ordinary surgical principles to the treatment of wounds in war. In the early days of the war, when not only the medical service but the entire military organization was more or less handicapped by the delusion that the experiences gained in South Africa should form the basis of all wars in the future, conditions were such that this application of these ordinary surgical principles, which sounds most simple and easy, was, on the contrary, a most difficult undertaking. However, as time went on, and South Africa was forgotten, the medical service very quickly adapted itself to the new era, and very soon conditions were altered in such a way that surgical principles could be applied with practically the same degree of perfection as they could be in civil practice; and with this new development, war surgery lost the rough and ready character which it had always borne, and now to a limited extent it might be said that civil surgery may be defined as the application to civil practice of those surgical principles which have been developed during the war.

Under the new conditions, changes in treatment were rapidly instituted, and then it was found that some of these surgical principles were not really principles, but only theories, and in the same way some of the so-called advances which the war has brought

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about are really reversions to older Listerian principles, which had been gradually falling into disuse.

Although the close of the war found many surgical problems still unsolved, nevertheless, many real advances have been accomplished and one need only mention surgery of the abdomen, surgery of the chest, tetanus, blood-transfusion, shock, etc., to recall a few lines along which definite progress has been made.

Before discussing the advances made in the surgery of any particular region, a few words might be said on the evolution of the treatment of wounds in general, which constitutes, perhaps, one of the most important lines of progress in war surgery. It can hardly be said that any new principles have been evolved, but principles which were known but were imperfectly appreciated, have been well developed and established.

Early in the war, the treatment might have been summarized as follows: The wounds were laid open, foreign materials removed, and to natural processes was left the elimination of tissues too badly damaged to recover their vitality. This did not take into consideration, or at least did not attach sufficient importance to, the well-known, but not so well appreciated principle that bruised and damaged tissues not only lose their power to destroy bacteria, but become splendid culture-media for the development of bacteria. The result was therefore prolonged elimination and suppuration. The natural sequence to this was the introduction of various substances to combat infections and eliminate diseased tissue. Some of these proved to be of very great value. Others however, did not stand the test of a severe trial. But gradually a more thorough appreciation of the principle that healthy tissue will not only resist, but eliminate a certain amount of infection, led to the more rational treatment by excision of all devitalized tissue, and in many cases, of immediate closure of the wound. This, of course, was possible only in a limited number of cases and the real field for antiseptics was found in the class of cases which could not be treated by primary closure.

Of the numerous antiseptics which have been used, only a few need now be mentioned, and of these there is little doubt that Carrell-Dakin's hypochlorite solution has proved the most satisfactory. The efficacy of this solution depends not only on its careful preparation, which is, however, essential, but on the exact method of its application as practiced by Carrell. The essential feature of this method, granted that the required operative procedures have been carried out, and that the dressings are done

aseptically, is that every portion of a wound surface is irrigated with the solution by means of Carrell tubes every two hours

Flavine has had many advocates, but the consensus of opinion seems to be that it is inferior to Dakin's solution. Many different forms of paste were used, the most popular being that known as bipp, a combination of bismuth, iodoform and paraffin, introduced by Rutherford Morison. This certainly seemed to do good in many cases, and Morison's own reports are most enthusiastic, but it is altogether probable that his excellent results are due, as are similar results, with other antiseptics, ninety-five per cent. to surgery and five per cent. to the antiseptic.

Sir Almroth-Wright's treatment by hypertonic saline solution did not give the results which its author predicted. His lectures and demonstrations were extremely interesting and convincing, and gave evidence of wonderful ingenuity and exhaustive experiments, but results obtained in the experimental laboratory could not with any degree of certainty be obtained in the ward, and this method was therefore comparatively short lived.

Immediate primary suture was preferably done within the first twenty-four hours after the receipt of the wound, but the term is also applied to suture any time within the first four days. In the work at the base hospital, it was found that some cases even four days old might be treated by excision, and closure, and this was sometimes done successfully even in cases of compound fracture.

Depage, of Brussels, summarizes the treatment as follows:

"The immediate suture is indicated in cases where the clinical aspect of the wound after debridement and epluchage gives a guarantee of sufficient sterilization. It may be resorted to especially:

1. In wounds of joints, and in general, in wounds of serous cavities.

2. In wounds of the cranium, of the face, of the hand and of the foot, where the abundance of vascularization, both blood and lymph, warrants a surgeon in making immediate suture as a rule.

3. In superficial wounds of the soft tissues, in certain fractures without comminution. This suture has the advantage of offering anatomical repair of the tissues, but infections, when they take place, are always rapid and grave, involving diffuse phlegmonous and gaseous gangrene.

Late primary suture, or early secondary, is indicated particularly for wounds involving soft tissues only and for some open fractures. It is done after bacteriological control has been made.

Late primary suture rarely fails of success on account of grave accidents.

Late secondary suture is reserved for wounds which can not be sutured during the first days, because of too extensive destruction of tissue, or because of the development of infection. It offers the great advantage of giving complete security, but it delays the healing and does not always give as perfect and anatomical restitution as the other forms of suture."

Considerable work has been done, and I think advance made in the study of surgical shock, and a brief résumé of the present position of scientific opinion on this very interesting subject might not be out of place. In the first place, it might be explained that there are two varieties of shock, the sudden primary shock that occurs on the receipt of an injury, analagous to fainting, and doubtless of nervous origin, and secondary shock which is the condition of real interest to the surgeon. Many different causes, such as, arterial or venous dilation, heart failure, acidosis, vaso-motor paralysis and supra-renal exhaustion have been assigned to this condition, but these on investigation have been found not to be the responsible factors. A number of investigators have assigned to fat embolism the principal rôle, since this condition has been found a number of times in post mortems, on cases dying from shock; but though this undoubtedly plays a part in some cases, it is certainly not the cause in the majority of cases. Sir Arbuthnot Lane ascribes the cause to his universal agent, intestinal auto-intoxication. The conclusion of the special investigation committee, appointed by the medical research committee, is that the chief, if not the only, factor is a deficiency in the volume of blood in circulation. This does not necessarily mean that there is an actual loss of blood from the body, but that blood is held up somewhere, and their conclusion is that this stasis is in the capillaries.

What is it that brings about such a dilatation of the capillaries? It has been observed that operations involving injury of large masses of muscle tissue are very prone to produce shock, and experiments have demonstrated that crushing large masses of m scle in animals produces a similar effect. Some chemical product of tissue injury must then be the responsible factor. It was at first thought that this might be lactic acid, but further investigations have proven that acidosis is a result and not the cause of the condition. (These injurious effects are intensified by any causes tending to depress the circulation, such as cold, hunger, fatigue and hæmorrhage.) It has been found that a base histimine will produce a

condition resembling shock, and there is reason for believing that substances of this kind are produced in injured tissues. Some interesting paradoxes have been noted. Constriction of the arteries usually results in high blood pressure. In shock we have constriction with low blood pressure. Low arterial pressure normally causes dilution. In shock we have concentration. This concentration is usually obvious enough, but the apparent defect of blood volume is serious out of proportion to the loss of plasma which the concentration indicated. What then are the indications for treatment? After applying the ordinary remedies, such as rest and warmth, the obvious indication is to increase the volume of the blood in circulation. Natural means should first be tried, such as giving fluids by the mouth or by the bowel. This in mild cases will probably suffice. The giving of salines intravenously has not proven very satisfactory, for the reason that simple saline solution does not remain in the blood vessels for more than half an hour. To insure that the fluid will not escape from the circulation, the addition of a colloid is necessary, and of various substances that have been tried, a six per cent. gum-arabic solution has been found the most satisfactory. As the majority of the cases suffering from shock in the wae zone were also suffering to a greater or less extent from hæmorrhage as well, the transfusion of blood would seem the most natural remedy. The consideration of shock has led to considerable discussion as to the relative merits of the various anæsthetics, and it has been demonstrated, beyond a doubt, that the safest and the one producing the least degree of shock, is nitrous oxide gas and oxygen.

The question of blood transfusion has been a very interesting one, and a discussion of the developments of surgery during the war would be far from complete without some reference to this subject. It was, of course, a subject of very great interest before the war, and the improvement in the technic and the advances made in the knowledge of the effect of transfusion have by no means been confined to the field of war surgery. But the vast scope for its application presented by the war has at least given an added impetus to the scientific study of its effect, and has proven beyond a doubt, in a practical way, that it is a life saving procedure of the greatest value. As far as one can learn, no very definite rules have yet been formulated as to the exact indications for transfusion, but familiarity with the technic, and firm conviction as to the very great benefit to be derived from it has gradually led to its adoption almost as a routine in all cases of severe hæmorrhage. It is now

regarded, not merely as a last resort in desperate cases, but a definite therapeutic measure that enables urgent operations to be performed under conditions otherwise hopeless.

The dangers of transfusion are two-fold, viz.: hæmolysis and agglutination. By hæmolysis is meant the destruction of the red blood cells, by agglutination the clumping of red blood cells. Either of these conditions may produce almost immediate death, and the necessity for preliminary tests is therefore apparent to all. The hæmolytic test is a fairly complicated one, whereas that for agglutination is comparatively simple. Fortunately agglutination may occur without hæmolysis, but hæmolysis is always accompanied by, or preceded by agglutination. One has therefore come to depend to a large extent on the agglutination test only. By means of the agglutination test it has been demonstrated that human bloods fall into four groups, based on the ability of the serum of one group to agglutinate the corpuscles of another. The corpuscles of group 1 are agglutinated by the serum of all other groups, but its serum has no agglutinating properties. The serums of group 2 and 3 mutually agglutinate each other's corpuscles. Group 4 serum agglutinates all other corpuscles, while group 4 corpuscles are not agglutinated by any serum. It follows then that a person in group 1 may receive the blood of a person of any other group, and that the blood of a person in group 4 may be given to a person belonging to any of the other groups, since danger in transfusing blood of an unlike group arises only when there is agglutination of the incoming corpuscles, the transfused serum being too much diluted when mixed with the recipient's blood to produce any agglutination of his own corpuscles.

Of the technic of the operation little need be said. Various methods have been devised, but only a few of these are now used to any extent. The direct method, that is, artery to vein, is rarely used now, for the reason that it is a little more difficult to perform, it involves the destruction of an artery, usually the radial, in the donor, and there is no way of estimating the exact amount of blood that is passing from the donor to the recipient. Lindemann's syringe method has some advocates, but it certainly does not possess any great advantages over the other methods. The method in use at No. 1 Canadian General Hospital was the Kimpton-Brown method, which was found very satisfactory. Probably the most popular method is what is known as the citrate method. It has this advantage, that blood can be collected and kept ready for use for days or even weeks. It has been noted, however, that

when blood is administered in this way, the patient frequently suffers from a severe chill, which, though not dangerous in itself, is sometimes rather distressing.

The question of how the beneficial effects of blood transfusion are produced, is still open, but it seems altogether probable that several factors are involved. First, there is undoubtedly a mechanical effect produced by the increased bulk of blood. Secondly, it has been well demonstrated that the corpuscles of the transfused blood may live for thirty days or even longer, and therefore, the real advantage of blood over any other fluid is due to the presence of functionating corpuscles. Third, there seems to be no doubt that the transfused blood has a definite stimulating effect on the blood producing organs. Fourth, there is also produced an increased coagulability of the blood. Hence its great advantage in cases of recurrent hæmorrhages. Fifthly, the transfusion of blood certainly seems to produce an increased resistance to infection.

Considerable advance, too, has been made in the treatment of tetanus. In the early days of the war the incidence of this disease was unexpectedly high, and to overcome this, the routine was adopted, as early as 1914, of giving preventive injections of anti-tetanus serum. Many statistics have been published from time to time, both in the French and British armies, which prove beyond any doubt that this procedure is of very great value. It has been proven experimentally, and demonstrated clinically, that tetanus will show itself earlier and more intense in proportion as the preventive injection has been made later. From experiment, it has been found that the immunity conferred by an injection of anti-tetanus serum is lost or is considerably lessened after a period of ten days. For this reason, an army order was issued that every man should receive four injections at intervals of a week. The usual injection was 500 units, but 1,000 units was advised in deep wounds. In very septic cases it was advised to continue the injections at the same interval for longer than four weeks. Similar orders to this were issued in the French army.

It has been found that late tetanus may develop many months after a wound has been received, or it may recur in cases many months after a patient has been apparently cured of tetanus. To what are these late cases of tetanus due? In wounds which cicatrise slowly, and are infected, the spores of tetanus remain in a latent state so long as they are bathed by organic fluids containing the antitoxin on the serum, but when this last is exhausted, by lapse of time, microbic vegetation can take place and tetanus ap-

pears. In cicatrized wounds, the spores of tetanus can exist on the surface of foreign bodies, or even in the tissues. Any traumatism, and more particularly surgical operations, may set free the infection. From this the rule has been laid down, always to practice a fresh injection of serum, preferably two days before any operation on a healed wound.

As to the method of administration, the consensus of opinion seems to be that the intrathecal route is the best, but as it would be almost impossible to give the large doses which are recommended, by this route, other routes must be used, such as the intravenous or intra-muscular.

Time will not permit more than the briefest mention of a few of the more important developments in the surgery of any particular region.

A new era has certainly been initiated in surgery of the thorax. When one recalls the elaborate apparatus that has been associated in one's mind, mostly from text-books, with surgery of the chest, and then considers how comparatively simple an operation it now is to open the chest widely, excise a portion of lung; where necessary, suture the lung, and close the pleura, one can realize that a decided advance has been made.

It can hardly be said that any great advances have been made in abdominal surgery, except those due to a fuller realization of the power of the peritoneum to overcome infection. In the later days of the war, drainage of the peritoneal cavity had become almost obsolete.

This extraordinarily strong capacity for overcoming septic infection, and also for forming adhesions, are characteristics possessed by all serous membranes, and it is the fuller appreciation of these characteristics that has influenced the surgery of the serous cavities. Perhaps this has been better exemplified in the treatment of joints than elsewhere. In the early days of the war the treatment of a wounded joint consisted in the drainage of the cavity. The results were bad. In general, an articulation kept open becomes infected, notwithstanding the greatest care. Later in the war, when it was realized that the synovial membrane could take care of a certain amount of infection, the practice of immediate closure became practically universal, and the results were infinitely better than under the old system.

Case Reports

CASE REPORTS FROM THE MONTREAL GENERAL HOSPITAL

PRIMARY SARCOMA OF THE MEDIASTINUM WITH POST MORTEM

CASE No. M. G. H., 1701-1919. Admitted March 31st, 1919. Died June 26th, 1919.

White female, age thirty-four years; one child living and well; no miscarriages; no history of infection or injury; lost fourteen pounds during the past year; no night sweats.

Complaint on Admission. Pain in the left side.

Present Illness: Well up to December 18th, 1919, when there suddenly developed a sharp stabbing pain in the left chest radiating to the left shoulder area. She had a slight cough without expectoration and thinks she had some fever. Seven weeks were spent in bed with apparently some improvement. After being up two weeks, she went to bed again on account of a return of pain in her chest.

Examination on Admission. Temperature 98·3°. Pulse 100. Respiration 20. Findings were negative with the exception of the mediastinum and left chest.

Mediastinum showed increased dulness except in its right upper portion.

Left chest showed impairment throughout, most marked in the apical portion and the base. From the apex to the second rib there was dulness, diminished tactile fremitus, voice sounds and breath sounds. The signs at the base were those found in pleural effusion. Large moist râles were present above the dull area at the base behind.

Right Lung. Negative.

While the patient was in the hospital, a period of eighty-eight days, all the signs and symptoms were referable to or dependent upon the lesions within the chest.

Left Lung. Signs of impairment gradually increased until there was dulness throughout.

Left pleural cavity was tapped three times, 1625 c.c. of fluid being removed. This was clear, straw coloured and free from blood and organisms. No tumour cells were found.

Mediastinal dulness increased in extent and intensity until the entire area was dull.

Right lung showed emphysema which became more and more marked.

The *left* vocal cord became paralyzed, accompanied by weakened voice.

Cough was present throughout the illness, slight at first but becoming marked. Toward the end, it was of a brassy character. There was no sputum.

Respirations varied from 20 to 30 During the last days of illness a stridor developed.

Circulatory System. The pulse varied from 100 to 120. The chief interest in the circulatory system centred about the heart. On admission its position was normal. No murmurs nor friction rub were heard. As the disease in the mediastinum and left lung progressed the heart was progressively forced to the right until it extended 9 cm. from the midsternal line and upwards to the second rib. Cardiac impulse became visible to the right of the sternum and increased in extent and intensity as the heart was forced to this side. A blowing systolic murmur, transmitted to the right axilla, developed and increased in intensity until it was heard throughout the entire right chest. During the last days of illness a pericardical friction rub developed.

Blood Findings. There was progressive anæmia of a secondary type. White blood cells varied from 11,000 to 21,000.

Two Wassermann tests were positive.

Temperature remittent in character developed, and varied from 99° to 103°.

The fingers became markedly clubbed and the nails curved.

Pain in the left chest and back was nearly always present but was never marked.

Towards the end, the signs and symptoms increased and she lost weight rapidly. There developed attacks of dyspnœa, cyanosis and increased stridor accompanied by great weakness, a feeble pulse, whispering voice and difficulty in phonation. These attacks increased in frequency, duration and severity until she died in one of them.

Treatment. Besides palliative treatment, six doses of Coley's serum were given and one dose of diarsenol. There was some

temporary improvement in her symptoms after the diarsenol but no apparent benefit was derived from the serum.

Four X-ray Examinations were made. They showed a fairly dense shadow throughout the lower four-fifths of the left chest with denser areas in the outer portion of the lower third and in the middle third near the spine.

Post-mortem Findings. Sarcoma of the mediastinum; sarcoma of the left lung; sarcoma of the trachea and right primary bronchus with partial obstruction, especially of bronchus; displacement to right of heart, œsophagus and trachea; atelectactic areas in left lung; emphysema, compensatory, of right lung; hypertrophy and dilatation of the heart; pericarditis, acute, fibrinous. The mediastinum showed extensive new growth. Similar growth was present in the left lung especially throughout the inner half. The more or less mobile tissues of the mediastinum were forced to the right. The wall of the trachea showed varying degrees of infiltration with tumour, and was compressed and somewhat narrowed throughout its course within the mediastinum. The left primary bronchus was extensively infiltrated with tumour and compressed so that its lumen was almost completely obliterated. The left recurrent laryngeal nerve was embedded in tumour tissue. The type of the tumour conformed to that of mediastinal sarcoma. No tumour in the right lung.

SUMMARY AND REMARKS: Female, age thirty-four years. Sudden onset pain in left chest; increasing dulness in left chest and mediastinum; non-hæmorrhagic pleural effusion, left side; heart progressively forced to right; increasing difficulty in breathing; stridor; paralysis left recurrent laryngeal nerve; increasing weakness of voice; persistent and increasing cough becoming brassy in character; no sputum. Emphysema developed in right lung. Two positive Wassermanns apparently unrelated to the principal disease. *X*-ray examination, dense shadow left lung area. The temporary improvement after diarsenol may have had no relation to the positive Wassermann. Some tumours, as glioma of the brain, may show temporary improvement after a non-specific drug, as potassium iodide

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Medical House Officer, Montreal General Hospital. (Service Dr. C. A. Peters.)

CHRONIC DIARRHŒA ASSOCIATED WITH AN ADENOMA OF THE THYROID GLAND

MRS. ——., age thirty-three, hospital No. 4229-19. Admitted September 19th, 1919, complaining of alternating diarrhœa and constipation, and of vomiting and headache.

She was born and has always lived in Barbadoes, British West Indies. She has had no infections, except measles and chicken-pox. Since childhood she has suffered from headaches. While she has never been otherwise ill than noted above, she has never been robust. Menstruation has been irregular. She has been married twelve years but has had no children.

Present Illness. Since 1910, a period of ten years, she has suffered from attacks of diarrhœa commencing in the morning with two or three loose stools containing mucus, ceasing during the day and returning the following morning. This at times continued for weeks or months.

Medication for the diarrhœa resulted in marked constipation. With the diarrhœa she had frequent attacks of right frontal headache and vomiting. These became much worse during the past year. There was no abdominal pain. Appetite was fair. She lost fifteen pounds during the past year and states that she is becoming somewhat "nervous".

Present Condition. Temperature 99°. Pulse 84. Respirations 20. Physical examination was negative except for a small adenoma in the right lobe of the thyroid gland.

In view of her residence in the South repeated careful examinations of the stools were made for amœbæ, other parasites and ova. None were found Tubercle bacilli were searched for with negative results.

The blood count showed: red blood cells, 3,828,000; white blood cells, 3,000; hæmoglobin, 80 per cent.; differential count; polymorphonuclear leucocytes, 71 per cent., lymphocytes, 26 per cent.; eosinophiles, 2 per cent.; transitionals, 1 per cent.

X-ray examination of the lungs was negative and a barium meal showed a normal stomach and no abnormal motility of the bowel.

In the absence of any other explanation of her symptoms, the thyroid adenoma was regarded as a possible underlying cause; (mild hyperthyroidism with intestinal manifestations). An ad-

renalin test was done with a positive result. This was repeated with a second positive result, and removal of the adenoma was advised. This was done, and after six weeks the patient had gained twenty-five pounds, had no return of the diarrhœa or constipation, slept well and was obviously less nervous.

Microscopical examination of the gland showed an adenoma with very abundant mitochondria.

The relation between adenoma of the thyroid gland and certain types of hyperthyroidism is, according to Goetsch, a definite one, and depends not on the size of the adenoma but upon its activity. This activity, according to him, may in some degree be measured by the response to the adrenalin test and to the presence of mitochondria in the tumour cells. The case reported above which showed a palpable adenoma of the thyroid gland with numerous mitochondria in the cells; gave two positive adrenalin tests; showed symptoms that may accompany hyperthyroidism and was greatly improved by the removal of the adenoma, illustrates the importance of keeping Goetsch's claims in mind.

A. H. Gordon, M.D.,
Physician to the Montreal General Hospital

A. T. Bazin, M.D.,
Surgeon to the Montreal General Hospital.

SUBMAXILLARY SALIVARY CALCULUS

MISS I. H., age twenty-nine. Hospital No. 320, 1920. Admitted January 22nd, 1920, with discharging sinus in right submaxillary region.

History of Present Illness. As long as she can remember she has had recurring painful swelling of a "gland" under the right jaw which would disappear after application of Tr. Iodine.

In 1913, she noticed a "small white point" in the floor of the mouth to the right of the median line. Pressure on this evacuated a large amount of "crumbly pussy matter". Daily probing and syringing for a period of three months resulted in cure and absence of all symptoms for the succeeding three years.

In 1916, she had tonsilitis and quinsy, worse on the right side, following which she had return of her neck trouble with

painful swelling beneath the jaw—reaching the size of a walnut and associated with earache and toothache on the right side. The attacks lasted about a week with intervals of from two to three weeks.

In November, 1918, a submaxillary abscess was opened and drained with only temporary relief. In January, 1919, and again in May, 1919, operations were performed (probably curetting of the sinuses). In June, 1919, teeth were *X*-rayed and some were extracted.

A sinus continued to discharge intermittently until date of admission. Recently she has noticed that when the sinus closed there was purulent discharge into the floor of the mouth.

Condition on Admission. A healthy looking young woman who has never been confined to bed through illness other than mentioned above. Teeth are well kept—some missing on right lower jaw. Gums are normal.

In the right submaxillary region there is a puckered scar surrounding a sinus which leads upward and outward beneath the body of the mandible and discharges a thin sero-pus. Proceeding downward and forward from this scar is a linear operation scar which is adherent to the deep fascia and extends to the mid line at the level of the cricoid cartilage. To the outer side of the puckered scar there is a firm, slightly tender mass which is partially concealed by the mandible, is slightly mobile and is diagnosed as the submaxillary salivary gland chronically inflamed.

The floor of the mouth shews the orifice of Wharton's duct on the right side to be widely opened as from distension or incision and the duct is visible as an œdematous cord. Palpation with one finger within and one without fails to reveal more than the presence of the indurated mass in the submaxillary space.

January 20th, 1920. Ether anæsthesia—intratracheal. Probing the sinus discovered a hard gritty substance in the depths of the mass. Injecting the sinus with methylene blue established its connection with Wharton's duct, the dye escaping freely into the mouth. The submaxillary triangle was exposed and the salivary gland together with Wharton's duct was removed. At the junction of the deep portion with the main body of the gland was found a rough calculus the size of a marrowfat pea. This was in a necrotic cavity which had extended into the substance of the hyo-glossus muscle.

The patient was discharged with the wound healed on January 30th.

Pathological Examination. The gland shows no alteration of structure beyond those changes due to inflammation.

SUMMARY. The history of recurring swelling of the gland in childhood points to an obstruction of the duct from infection, due probably to a stomatitis. This had led to an ascending infection with stasis of the secretion and formation of the calculus. Salivary calculi are more common in the submaxillary and sublingual glands than in the parotid as the secretions of the former are more viscid and contain more salts than does the secretion of the parotid.

Duct calculi are usually single—gland calculi are frequently multiple.

ALFRED T. BAZIN, M.D.,
Surgeon to the Montreal General Hospital.

ERYTHEMA MULTIFORME MISTAKEN FOR LESIONS DUE TO CHEMICAL POISONING

MISS A. C., aged thirty-seven years, was admitted twice to the Montreal General Hospital for the same disease, in May and December, 1919.

The personal history contained nothing of interest apart from repeated attacks of the present illness, which had appeared once or twice a year since early childhood, coming on in March or April in England, where she was born, and in May since coming to Canada eight years ago. The second yearly attack usually appeared in the autumn but the last one developed in December.

The illness was invariably ushered in by fever, often reaching 102°, headache, malaise and pains in the larger joints. These signs and symptoms subsided in a few days On the second or third day small erythematous areas appeared on the extremities, below the elbows and knees, the lesions being much more numerous on the hands and feet, the palms and soles being equally involved with the dorsal surfaces. There was a sensation of burning or tingling in the skin lesions and from day to day they changed rapidly in character. As they increased in size, the central part showed a vesicle or bulla containing a clear serous fluid, but not raised above the level of the surrounding skin. The periphery of the vesicle consisted of two or more zones of variously coloured erythema, concentrically arranged (erythema iris). On the

palms and soles the lesions were so large (often reaching an inch or more in diameter) and so sensitive to touch that they prevented the use of the hands and feet and the patient was forced to remain in bed. Coincidently with the skin eruption one or two herpetic vesicles appeared on the vermilion border of the lips, and these when ruptured gave rise to repreated small hæmorrhages, often difficult to control. The attacks in the two instances observed lasted about three weeks, the contents of the bullæ drying up and the overlying skin desquamating without leaving any scar. The patient stated that mild attacks were often of shorter duration, and occasionally the blebs became infected through accidental rupture and then they required longer to heal.

On her first admission to hospital the disease had reached its acme before it was seen, but on the second the patient came under treatment the second or third day of the attack and the effect of giving full doses of sodium salicylate was tried with much apparent benefit. The soreness was lessened, the evolution of the lesions arrested, and the duration of the illness was considerably shortened. Lead lotion on lint was applied locally during the first attack, but in the second the parts were simply protected by a dry gauze bandage.

The interesting features of this case were its apparent close relationship to rheumatic fever, suggested by the recurrent attacks and their prompt alleviation by sodium salicylate, and the manner in which failure to recognize the nature of the disease had handicapped the patient. Before coming to Canada she had trained as an expert in photographic development, but was advised to abandon her trade as her attacks were supposedly due to poisoning from the chemicals used. The first attack which developed in Canada was attributed to poison ivy, and the later ones to recurrences. The profession still clings to the belief that an attack of ivy poisoning can recur year after year without renewed exposure.

The main point in the diagnosis of erythema multiforme is the rapidity with which the character of the lesions changes. Twenty-four hours is a sufficient time for complete alteration of appearance.

G. Gordon Campbell, M.D.,
Physician to the Montreal General Hospital.

VEIL PIN IN A BRONCHUS. REMOVED THROUGH BRONCHOSCOPE

MRS. L. F. B., age thirty. Hospital No. M. G. H. 943, 1920. Patient was admitted February 26th, 1920, with the following history:

While dining in a restaurant five days previous to admission, a small bead-headed pin became dislodged from her veil, falling between the veil and face into the mouth. A sharp pricking sensation in the throat caused her to inhale quickly and the pin was lost.

Following this, the patient had no symptoms, but feeling anxious, consulted her family physician two days later. Examination of the pharynx and larynx was negative, and there were no signs of bronchial irritation.

On the third day, the patient developed a slight cough with a sensation of constriction in the neck immediately above the sternum. On drinking water the sensation disappeared. In the evening a paroxysm of coughing occurred accompanied by a sense of suffocation. She ran into the street for fresh air and again the symptoms subsided.

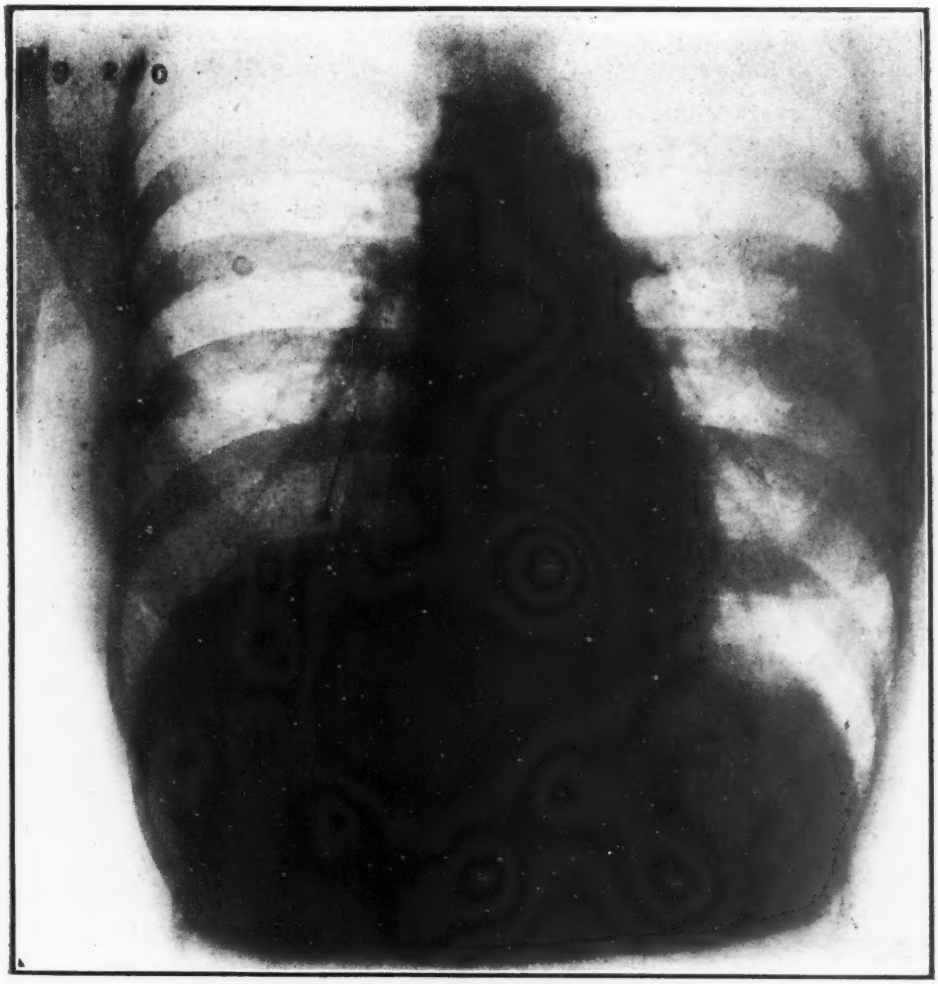
She again consulted her physician who advised an *X*-ray examination.

The fluoroscopic screening (confirmed by the developed plate) showed the shadow of a pin about two inches long with a round head the size of a small pea lying in a branch of the right primary bronchus, the point directed upwards.

Patient was admitted to the hospital and prepared for operation, which was performed on the afternoon of the fifth day following the accident. Morphia and atropine were given hypodermically one-half hour prior to operation.

Patient was etherized and in the darkened operating room the bronchoscope was introduced, the larynx, trachea and right bronchus being sprayed with 10 per cent. cocaine solution in front of the advancing instrument. The pin was then seen by the operator.

Under fluoroscopic control, the bronchoscope was brought into relation with the shadow, and alligator forceps passed through the bronchoscope were guided to overlie the pin which was readily grasped and withdrawn.



X-RAY CHEST, SHOWING VEIL PIN IN BRONCHUS

Antero-posterior view of chest

The patient has made an uneventful recovery.

REMARKS. The sensation of smothering noted on the third day is explained by the cough dislodging the pin and forcing it up against the subglottic portion of the larynx, inducing spasm of the glottis.

In suspected inhalation of a foreign body an early *X*-ray examination is imperative. Physical signs do not develop until serious complicating damage and infection have been produced.

The fluoroscopic control enables the operator to pass the bronchoscope to the site of the foreign body with speed and precision, thus saving a great deal of unnecessary manipulation with attendant irritation of or damage to the bronchial mucosa.

ROBT. H. CRAIG, M.D.,
Oto-Laryngologist,

W. A. WILKINS,
Roentgenologist,
Montreal General Hospital.

THE nationalization of the medical profession in Great Britain is suggested. Should the scheme materialize, the doctors will become the servants of the State like the army, navy, and civil services. That is to say, they will be under the supervision of the State, paid by the State, and their energies directed by the State. Dr. John Playfair, Director of the Medical Guild, says that numbers would be willing to accept State medical service if such service were limited to the needy classes. It is feared, however, that the proposition might ultimately embrace a whole community, including hospitals and all institutions in any way connected with the maintenance of the health of the people. Such a sweeping movement would not only be antagonistic to all feelings and aspirations of the doctors, but would tend to reduce all professional activities and attainments to a dead level, and would entirely abolish all feeling and sympathy between doctors and patients which members of the guild cherished and upheld, and would be a bad bargain for the nation as leading to inefficient and perfunctory medical attendance.

Editorial

PROPHYLAXIS OF INFLUENZA

THE present epidemic of influenza is marked by predominance of the catarrhal type of the disease. This fact probably accounts for the prevalence of broncho-pneumonia, the morbid process extending from the upper air passages to the bronchioles and alveoli. In the epidemics of 1889-90 and following years it is our impression that catarrhal symptoms were much less prominent and pneumonia certainly occurred in a smaller proportion of the individuals attacked.

Although the number of cases of pneumonia in the present epidemic is much smaller than in 1918, yet its incidence has been all too frequent, and whilst on the whole the severity of the disease has been less, the large number of fatalities bears witness to its virulent and often intractable character.

The feeling of helplessness with which the treatment and control of epidemic pneumonia has been regarded is gradually giving way to a more hopeful attitude. Vaccines have played such an important part in the prevention of typhoid, tetanus, and other infections that progressive pathologists and clinicians are endeavouring to obtain an equal success in the prevention of influenza and its serious pulmonary complications. The problem has been rendered more difficult by the confusing bacteriological results obtained by so many observers. The failure in the past to detect Pfeiffer's bacillus in fatal cases led many pathologists to regard this organism as non-essential and to attribute the malady to pneumococci and streptococci. An improved technique has, however, revealed the influenza bacillus in an ever increasing number of cases; and it has also been shown that it favours the growth of other bacteria on plate cultures

It thus appears that the Pfeiffer bacillus is regaining its position as the primary invading agent favouring the development of pneumococci and streptococci which all observers agree are found in the morbid lesions in the lungs and are probably responsible for them.

Leishman (*B.M.J.*, Feb. 14, 1920) records the very encouraging results in the British army from the use of large doses of a mixed vaccine as a prophylactic measure. The revised formula contains B. Influenza, 400 millions to 1 c.cm.; Streptococci, 80 millions to 1 c.cm.; Pneumococci, 200 millions to 1 c.cm. Of this ·5 c.cm. are given as the initial dose and 1 c.cm. as a second at an interval of ten days.

In 15,624 inoculated cases, 221 only were attacked by the disease, whilst 2,059 cases among the non-inoculated occurred. As about 60,000 men were under observation the inoculated appeared to have enjoyed a marked relative immunity. Pulmonary complications occurred in 26 inoculated men, with a mortality of two, and in 583 non-inoculated with a mortality, of 98, again showing a favourable result for the vaccine.

A summary of the results shows that there were:

	Inoculated	Non-inoculated
Number of men in camps under observation	15,624	43,520
Incidence of attack per 1,000	14.1	47.3
Incidence of pulmonary complications per 1,000	1.6	47.3
Deaths per 1,000	.12	2.25

The protective results would have been probably even more striking had the full dose in all cases been given; nearly half of those classed as inoculated men received only the initial dose, or one-third of what is regarded as necessary for the fullest measure of protection.

It seems somewhat doubtful if inoculation at the onset of an attack is capable of modifying the disease or of preventing pneumonia. A period of two or three weeks, it is

stated, is required to bring about the formation of any antibodies. As pneumonia frequently follows the onset of the attack within a few days, this statement, if correct, would indicate that no benefit could accrue from using vaccine after the development of the initial symptoms.

Vaccine treatment has not proved particularly encouraging in any general infection. In spite of this, however, Goldstein (*Am. Jn. Clin. Med.*, Dec. 1918, Jan., 1919) states that he has had rapid improvement by the use of large doses of a mixed vaccine in influenza and without untoward results.

Other measures of prevention should not be neglected. As the disease is doubtless spread by the secretions of the air passages, attendants on the sick are well advised to wear a cheesecloth mask containing a thin layer of cotton wool. The neglect of this measure is largely due to the attending discomfort. Even more important is the avoidance of large public gatherings. There can be no doubt that the popular picture houses are important agents in the spread of the disease.

The excellent results obtained by Cole at the Rockefeller Institute in the treatment of pneumonia, types 1 and 2, by serum should encourage the use of this agent, particularly where facilities exist for bacterial observation.

SALVARSAN IN SYPHILIS

THE large number of reported cases of severe poisoning from salvarsan found in current literature suggests that this group of arsenical preparations is either more dangerous than we were led to believe or that it is being administered in a manner that fails to safeguard the patient. The symptoms that arise and their interpretation from the post-mortem findings are described in a paper by Strathy, Smith, and Hannah published in the present issue of the Journal. The authors report a series of fifty-eight cases of poisoning follow-

ing the administration of "606" preparations, eight of the number ending fatally, and show conclusively that arsenic is the toxic agent. Wide variations in the amount of the fatal dose suggest an undue susceptibility to the action of the drug in some cases, though faulty methods of administration and differences in the toxicity of the various substitutes for salvarsan may equally well be put forward as a cause.

An idiosyncrasy to the action of any drug is a factor which cannot be recognized before hand and guarded against; its presence can only be determined with safety in the case of the stronger poisons by proceeding with the utmost care in their administration, feeling one's way so to speak, by giving a much smaller initial dose than the occasion demands and carefully watching the result. One cannot help the inference, however, judging from the number of fatal cases, that overdosage rather than any special susceptibility to the arsenic, is the factor accountable for many of them.

Syphilis, like tuberculosis, seems to have acquired a position of undue importance in the eyes of those who make a specialty of treating it, and for this reason, in their efforts to eradicate it, they often exceed the limits of safety. In salvarsan, we have reason to believe, we have a possible cure for syphilis and there is a strong temptation to make sure of its effect by pushing it to the utmost limit. Should one deny the possibility of obtaining a complete cure, as many do, the objection to the use of excessive dosage becomes unanswerable. It is universally admitted that salvarsan has at least the power of destroying the spirochætes in the accessible parts of the body and healing the visible lesions, and thus checking if not curing the disease. Courses of moderate dosage repeated at intervals, if the blood shows the disease to be still active, would seem more reasonable than excessive doses with the attendant risk. It is better for the patient to live twenty years or longer with the disease kept in check than to risk his life in the hope of securing a possible cure.

The present method of administration commonly adopted,

which calls for repeated courses of salvarsan combined with mercury for a period of two years, seems a survival from the days when mercury and the iodides were the accepted methods of combatting the disease. Both these drugs have the power of resolving the skin lesions, though not in such a rapid manner as salvarsan, and thus are capable of keeping in check the secondary symptoms; symptoms which disappear spontaneously after two or three years. Hence in the absence of any test for determining whether the virus was still active, treatment, before the advent of salvarsan and the Wassermann test, was kept up until these evidences of the disease had ceased making their appearance, and it was hoped that a cure had been effected, a hope which was often dispelled long afterwards by the appearance of visceral or cutaneous tertiaries. Now that we have in a properly carried out Wassermann a reliable test of the effect of our medication, there is not the same indication for continuing treatment over a long period of time unless the virus is found to be still active. It is at least doubtful whether a drug which fails to destroy an organism when used for the first time can accomplish more on being repeated.

When the recognized method of treatment adopted by the profession for any disease subjects the individual receiving it to possible loss of life, it must inevitably lead to its entire abandonment, once this risk becomes generally known, and especially so when the disease for which treatment is instituted is not of itself immediately dangerous to life. This may well be the fate of salvarsan unless the profession awakes to the fact that in it we have a most dangerous preparation as well as a most valuable one.

THE next meeting of the American College of Surgeons is to be held in Montreal, during the week commencing the eleventh of October. The headquarters will be the Wind-

sor Hotel. This will be the first meeting outside of the United States. It is expected that about two thousand Fellows of the college will be in attendance. Daily clinics will be held in the English and French hospitals. The clinics will embrace surgery and the surgical specialties, and already arrangements are well under way. It means a big effort. The numbers are large, but our facilities are large, and by good organization it is hoped that all the Fellows may be accommodated.

In the afternoons there will be held in the Windsor Hall demonstrations of living cases showing end results, methods of treatment, etc. These demonstrations, which are called dry clinics, may prove most interesting and "dry" only in name.

There will also be held evening meetings, for which an interesting programme is being prepared. The last evening meeting, will be the Convocation, when new members will be admitted to the fellowship. A number of distinguished foreign guests are expected from France and from Great Britain.

The American College of Surgeons is already a large and influential organization. The aim is to raise the standards of Surgery. It has accomplished a great deal in that direction. It is also doing a very useful work in standardizing hospitals, and hospital administration and is always willing to help solve local difficulties and entanglements. A large number of Canadians are Fellows of the College, and the President, Dr. W. J. Mayo and the Secretary-General, Dr. Franklin H. Martin, are at present in South America, interesting the surgeons of the southern portion of the Western Hemisphere in the aims and ideals of the College. It is expected that a considerable number of these gentlemen will attend the Montreal meeting and become Fellows of the College.

A very suitable building in Chicago has been given to the College by the profession and citizens of Chicago in honour of the late Dr. John B. Murphy, who contributed so much during his lifetime to the science and art that he loved, and who took such a prominent part in the organiza-

tion and work of the College. The building was one of the largest and most beautiful residences of Chicago. It will be a most suitable home, and there is sufficient vacant ground upon which to build a museum. Dr. Frankland Martin has made *Surgery, Gynæcology and Obstetrics* the official organ. It is a most generous and valuable gift. The endowment fund is now nearly a million dollars which promises well for future usefulness.

Funds to the extent of £20,000 for the erection and equipment of an institute for parasitological research, with an additional £10,000 for its upkeep and maintenance, have been received by the senate of the University of Cambridge. The money is the gift of Mr. and Mrs. A. P. Molteno, and is the result of their interest in the labours of Professor Nuttall, which the donors feel have already produced results of immense benefit in the control and prevention of parasitic diseases both in men and animals. It i imperative that futher researches of the same kind be made, if tropical regions are to become habitable for men and animals of European stock. The gift is made to the University of Cambridge, of which Mr. Molteno is a graduate, and a member of Trinity College. The gift provides Cambridge with accommodation for research work which it lacks at the present time. It is given as a token of high regard for the University.

The Association

ANNUAL MEETING, VANCOUVER, JUNE 22ND TO 25TH

PRELIMINARY PROGRAMME

Address in Medicine—Charles Lyman Greene, M.D., St. Paul, Minn.

Address in Surgery—Lieutenant-Colonel F. Mewburn, Calgary.

Address in Genito-Urinary Surgery—H. H. Young, Baltimore.

SECTION OF MEDICINE

C. F. Martin, Montreal—"Relation of metabolism to clinical medicine.'

A. H Gordon, Montreal—"Treatment of hæmorrhage in medical disease.'

Wm. House, Portland, Ore —"Occultism and insanity."

Dr. MacAllister, New Westminster, B.C.—"Facial expression in various types of insanity."

J. A. Oille, Toronto—"Functioning of the heart in cardiac disease"

W. Goldie, Toronto—"Signs and symptoms of gastro-intestinal diseases."

A. R. Robertson, Vancouver—"Cerebral syphilis."

W. S. Lemon, Rochester, Minn.—"Pulmonary abscess."

N. B. Gwyn, Toronto—"Encephalitis lethargica."

N. B. Gwyn, Toronto—'Influenzal empyema."

R. H. M. Hardisty, Montreal, and G. E. Richards, Toronto—"Diagnosis of gastric diseases."

G. S. Strathy, Toronto—"The action of arsenic on the liver"

G. H Manchester, New Westminster, B.C.—"Shell shock."

H. A. Lafleur, Montreal—"To be announced."

John P. Manning, Seattle, Wash.—"Continuous fever in children from streptococci infection in blood stream with recovery"

M. A. Smith, Halifax—"Modern treatment of gastric disease."

J. A. McGregor, London—"To be announced."

H. A. McCallum, London—"To be announced."

SECTION OF SURGERY

J. McKenty, Winnipeg—"Acute intestinal obstruction."

Hadley Williams, London—"Series of acute perforations of the duodenum and stomach."

W. S. Galbraith, Lethbridge, Alta.—"Surgical achievements of small western hospitals."

G. E. Armstrong, Montreal—"Some of the basic principles of abdominal surgery."

W. A. Lincoln, Calgary—"An unusual condition complicating hour-glass conditions."

A. Gibson, Winnipeg—"The need of exact anatomical knowledge in nerve surgery."

A. T. Bazin and A. Ross, Montreal—"Acute and chronic intestinal obstruction."

E. W. Allen, Edmonton!"Carcinoma of colon."

D. W. Graham, Swift Current, Sask.—"Œsophageal strictures."

J. E. Lehman, Winnipeg—"Pulmonary abscess."

Roland Hill, Grand Rapids, Mich.—"The traumatic abdomen."

M. Sharpe, Brandon, Man.—"Local anæsthesia."

N. J. Maclean, Winnipeg—To be announced.

H. A. Bruce, Toronto—To be announced.

J. S. McEachren, Calgary—To be announced.

H. J. Hassard, Portage la Prairie—To be announced

W. J. Stevenson, London—To be announced

Symposium on Thyroid

F. N. G. Starr, Toronto—"Goitre and its treatment."

C. C. Tatham, Edmonton—"Observations and results of the surgical treatment of goitre."

G. A. Bingham and G. E. Richards, Toronto—"Correlation of the results of treatment by surgical and *x*-ray method."

J. M. Pearson, Vancouver—"The medical aspect of goitre treatment."

Genito-Urinary

W. W. Jones, Toronto—"Ureteral stone."

J. A. E. Campbell, Vancouver—"Some phases of syphilis."

Charles H. Hair, Toronto—"Genito-urinary infections."

G. S. Gordon, Vancouver—"On examining and operating by the endo-cystoscope."

G. S. Whiteside, Portland, Ore.—"To be announced.

Section of Obstetrics and Gynæcology

Robert Ferguson, London—"A plea for better obstetrics."

W. P. Graves, Boston—"Immediate and late results from the use of radium for non-malignant uterine bleeding."

Louis Frank, Louisville, Ky.—"Radium in the treatment of cancer of the uterus."

H. P. Newman, San Diego, Cal.—"Certain considerations and recommendations in special plastic surgery of the cervix uteri."

A. C. Hendrick, Toronto—"The bleeding uterus, its pathology, diagnosis and treatment."

Angust McLean, Detroit—"Thrombosis and emboli in abdomen."

H. M. Little, Montreal—"Modern obstetrical technique."

J. W. Duncan, Montreal—"Toxæmia of pregnancy."

John C. Hirst, Philadelphia—"Operative treatment of cystocele in women of child bearing age."

George H. Noble, Atlanta—"Principles envolved in surgical relief of downward and backward displacement of the uterus."

F. L. Horsfall, Seattle, Wash.—To be announced.

Section of Orthopædics

V. P. Gibney, New York—"Development and scope of orthopædic surgery."

A. R. Macausland, Boston—"Treatment of fractures."

A. Gibson, Winnipeg—"Treatment of habitual dislocation of shoulder."

H. P. H. Galloway, Winnipeg—"Treatment of fracture of the neck of the femur."

James Patterson, Vancouver—"Painful feet."

Fred. H. Albee, New York—"Osteoplastic surgery."

Winnett Orr, Kansas City—"What can we do for the hopeless cripple?"

E. G. Abbott, Portland, Me.—"Compression fracture of the spine."

Section of Eye, Ear, Nose and Throat

G. B. Fletcher, Winnipeg—"Modern uses of the bronchoscope."

Scott Moncrief, Victoria—"Ætiology of idiopathic iritis and its rarety in India."

J. Rosenbaum, Montreal—"Interstitial keratitis."

Sterling Ryerson, Toronto—"The uses of radium in opthalmology."

The following will contribute papers on *x*-ray work: W. A. Wilkins, Montreal—"The diagnostic value of *x*-ray in pulmonary tuberculosis." Dr. J. C. McMillan, Winnipeg—Title to be announced; and others.

CANADIAN PUBLIC HEALTH ASSOCIATION

Vancouver, 21st to 23rd

Preliminary Programme

Monday, 10.30 *a.m.*

Meeting of Sections: Child Welfare, Mental Hygiene, Social Hygiene, Laboratory, Tuberculosis Association

2 *p.m.* General Session:

Address of Welcome, Dr. the Honourable J. D. McLean, Minister of Education, and Mayor Gale of Vancouver.

Presidential Address—H. E. Young, Victoria.

Encephalitis Lethargica—Gordon Bell, Winnipeg.

8.30 *p.m.* Public meeting Canadian Tuberculosis Association.

Tuesday, 9.30 *a.m.*

Meetings of Sections.

2.30 *p.m.* General Sessions:

Symposium on Public Health; its organization and progress in Canada. Speakers—Dr. J. A. Amyot, Deputy Minister of Health, Provincial health officers, and members of the Connaught laboratories.

8.30 *p.m.* Public meeting.

Address by Dr. J. A. Amyot—"The Federal Government and Public Health."

Wednesday, 9 30 *a.m.* Meeting of Sections:

Symposium on venereal diseases.

2.00 *p.m.* General Session:

Symposium on nursing. Speakers—Miss Jean Gunn, Toronto; Miss Helen Randal, Vancouver; Miss Eunice Dyke, Miss Jean Browne and Miss E. Johns.

Section of Therapeutics

DIGITALIS

By D. S. Lewis, M.D.

Montreal

Cohn: "The Clinical Pharmacology of Digitalis." *Medical Clinics of North America*, i, 563, 1917-1918.

Cohn, Fraser and Jamieson: "Influence of Digitalis on the T-wave of the Human Electro-Cardiogram." *Jour. Exp. Med.*, xxi, 593, 1915.

Eggleston: "Influence of Large Doses of Digitalis and Digitoxin on the Blood Pressure in Man." *Jour. Amer. Med. Assoc.*, lxix, 951, 1917.

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Jamieson: "The Action of the Lethal Dose of Strophanthin in Normal Animals and in Animals with Pneumonia." *Jour. Exp. Med.*, xxii, 629, 1915.

Cohn and Jamieson: "The Action of Digitalis in Pneumonia." *Jour. Exp. Med.*, xxv, 65, 1917.

Cole: "The Treatment of Lobar Pneumonia." *Med. Clinics, N.A.*, i, 545, 1917-1918.

FEW drugs have been more widely used than digitalis, and yet no drug has been the subject of greater confusion as regards its mode of action.

This confusion is largely due to the clinician's failure to recognize that it is impossible to apply the results of the pharmacological laboratory directly to the clinical material in the wards. The laboratory worker uses a different species of animal for his experiments and an absolutely different scale of dosage. For example, Gottlieb and Magnus used from five to fifteen times the lethal dose to obtain their effects on the blood pressure. It is no wonder that confusion reigned when similar pressure effects were looked for, after therapeutic doses.

In the past decade, the introduction of the electro-cardiograph has ushered in a new era in clinical cardiology. There has been a reinvestigation of the pharmacology and therapeutics of digitalis, with a readjustment of our ideas concerning the drug's mode of action, and its therapeutic effects.

It has long been recognized that digitalis acts chiefly on the heart, the medullary centres, the vessels and blood pressure, and possibly on the kidneys. It is in our interpretation of these effects that the main advances have been made.

1. *Action on the Heart.* Digitalis has a definite effect on the heart muscle. It stimulates its powers of contraction, and there is a slowing of the whole cardiac cycle, of the systolic as well as of the diastolic phase. These changes are found even in hearts with normal mechanism. In greater doses the drug has a depressant action on the conductivity, which is evidenced by a delayed conduction time, and later by varying degrees of block.

Until recently we had no simple means of demonstrating these effects, but Cohn, Fraser and Jamieson have found that the electro-cardiogram can be used to estimate these changes. They find that the T-wave becomes inverted in all three leads when the heart is completely under the influence of digitalis, and consider this inversion an evidence of a fuller and more complete contraction of the cardiac muscle.

Under digitalis, therefore, systolic contraction and diastolic relaxation are more complete, and more blood is expelled from the heart with each contraction. This is in accord with the work of Stewart and Scott who found an increased rate of flow in the vessels of the arm following the administration of digitalis in cardiac disease.

2. *The Vagus Action.* Digitalis produces a large part of its slowing of the pulse rate by a stimulation of the vagus, but this slowing is only a very moderate one in normal rhythm. Cohn states that slowing of the regular heart is not a function of digitalis in therapeutic doses. Under these conditions it rarely causes a decrease of more than five or ten per cent. in the pulse rate, but in the tachycardias it has a more marked effect. It is, however, in auricular fibrillation that one sees the almost miraculous effects of the drug on the heart rate, but here the slowing is almost entirely due to the action on the conducting system. It is not a vagus slowing and atropin shows very little, if any release in cases of fibrillation which are under the influence of digitalis.

3. *Action on the Vessels and Blood Pressure.* Under digitalis, the blood pressure is not necessarily raised, indeed it frequently

falls, and it is now felt that digitalis may raise, lower, or not affect the systolic pressure. On the other hand, it more or less constantly causes a fall in the diastolic pressure. Eggleston suggests that this drop is possibly the result of a vasodilatation as opposed to the usually accepted view that digitalis causes a vasoconstriction. It may be said, then, that digitalis has no constant effect on the systolic blood pressure, but that it consistently increases the pulse pressure, and always tends to restore the pressure to its most efficient level.

4. *Action on the Kidneys.* Digitalis has little if any direct action on the kidneys Its diuretic effect is caused almost entirely by the improved circulatory conditions, and by the consequent increase in the blood supply to these organs.

Therapeutic action. In the clinical application of the drug, the signs of its favourable action are well known. There is a greater or less slowing of the heart rate according to the type of lesion. In fibrillation there is a lessening of the *pulse deficit.** There is a ubsidence of the dyspnœa, orthopnœa, and cough, with a consequent fall in the respirations. There is a clearing up of the moist râles at the lung bases. The congestion of the liver and of the splanchnic circulation disappears. The cyanosis becomes less marked and the coldness of the extremities vanishes. The kidneys secrete more rapidly, and drain the œdema and accumulated fluids from the body.

Suitable cases for digitalis treatment. There has been much difference of opinion as to what cases are suitable for treatment with digitalis. One group would confine the drug entirely to the treatment of auricular fibrillation. The adherents of this school are steadily losing ground, and there is a gradual return to the opinion of men like Janeway, Christian and others, who have always maintained that digitalis can be used with advantage in many conditions other than fibrillation.

Digitalis is of marked value in many cases of chronic passive congestion with no irregularity, and with little if any tachycardia. Many experienced clinicians also feel that in the mild myocardial weakness of later middle age, digitalis has a very real place as a tonic to the heart muscle. The drug has a more marked effect where the mitral valves are involved rather than the aortic. This is partly due to the greater frequency of coronary disease in the latter type of case, where the changes in the myocardium are of a more serious character. It is vain to look for a stimulating and tonic action of the drug in a seriously sclerosed muscle.

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*Pulse deficit. The difference in the pulse rate as counted at the heart and at the wrist.

Results of treatment. Favourable action cannot be expected in every case of cardiac disorder, but Pratt states that in suitable cases, failure to obtain this result is due to one of two factors: too small dosage, and the use of weak or inert preparations of the drug. To these Christian adds a third, the neglect of complete rest as a valuable adjunct to the treatment.

With regard to the first, too great a prominence has been given to the cumulative action of digitalis, and to the dangers of overdosage. If the onset of nausea and anorexia be taken as the signal for increased caution in the administration of the drug, then the dangers are comparatively slight and can be easily controlled by a decrease in the dosage. Cushny states that the best results are often obtained with larger doses than the pharmacopœas admit. The huge initial dosage advised by Eggleston is still viewed with suspicion by many clinicians, but the rapid control of the tachycardia in fibrillation is of distinct interest. He obtains a marked digitalis effect within eight to ten hours, while similar results cannot be obtained under thirty-six to forty-eight hours with the older methods.

In urgent cases of cardiac decompensation, digitalis is often preceded by an intravenous or intramuscular injection of strophanthin (0·5 mg. in 5–10 c.c. of normal salt solution). The results of these injections are shown within two to six hours by a marked slowing of the pulse, and by symptomatic improvement. The drug should only be given after careful questioning has proved the absence of any recent use of digitalis. The strophanthin is followed immediately by the usual doses of digitalis, so that the patient is well under the influence of that drug by the time the strophanthin effects have worn off.

It is also well to remember while dealing with dosage that drops and minims of tinctures are not interchangeable terms. There may be from thirty-five to fifty-five drops of tincture in fifteen minims. Preparations should be actually measured in a minim glass, and not dropped from a dropper, if adequate dosage is to be ensured.

The second cause of failure is a very real one. MacKenzie states that he has never seen an inactive preparation of digitalis. On the other hand, Rowntree and Macht found great variations in the strength of the leaves supplied by well known houses, and Pratt in twenty-four specimens of American leaves found only six stronger than the pharmacopæal standards, three were of equal strength, while fifteen were weaker. An active preparation

is a prime necessity. The expensive proprietary products have no advantage over the ordinary ones of the pharmacopœa, provided an active leaf has been used by the dispensing chemist. The tincture, dry leaf, or the infusion will give excellent results if properly used.

Successful digitalis treatment is based on the choice of suitable cases, the use of a sufficient dose of an active preparation, and the rigid insistence on complete rest till the desired results have been obtained.

Digitalis in fever. Perhaps the most recent ground of dispute in the use of digitalis has been the question as to whether the drug preserves its activity in fever.

In 1913, MacKenzie stated that digitalis had no place in the treatment of the acute infections; that the organism was so completely under the influence of the toxic agents that the drug could have no effect. His views were shared by Gibson and others. In 1915, Jamieson, working on cats with experimental pneumonias, showed that the toxic effects of the drug were not impaired. That similar doses of the digitalis series produced fatal results in both febrile and afebrile animals. Later, Cohn and Jamieson found that under similar conditions of dosage digitalis produced the same changes in the electro-cardiograms of cases of pneumonia as in afebrile individuals. In five pneumonias, who developed auricular fibrillation in the course of the disease, they found the same response to the drug as in fibrillators without fever. They concluded that digitalis had a very definite effect in fever. Cole thinks that the drug is not needed in many cases of pneumonia, but that in others it is life saving. Digitalis has a definite effect on hearts with insufficient power, and that effect is a favourable one.

To obtain rapid results, the patient should be kept partially saturated with drug during the course of the disease, otherwise when the emergency arises some drug will have to be given intravenously. This procedure is not without danger, where, as is often the case, a definite statement regarding previous digitalis treatment cannot be obtained. At the Rockefeller Hospital, it is therefore customary to give moderate doses of the drug during the earlier course of the disease. If fibrillation develops later, then the larger doses can be started on a patient already partially saturated with the drug.

Recently, Hart has published results on a series of influenzal pneumonias. He finds the same characteristic changes in the electro-cardiogram as were found by Cohn, but he denies that the

drug has any effect on the course of the disease, or on its outcome. The mortality is just as high in the cases receiving digitalis as in those who receive none. He qualifies his conclusions by stating that in influenzal pneumonias the cardiac phase is the least important. Cases coming to autopsy show no marked cardiac involvement, and death is due to an overwhelming toxæmia in which cardiac failure plays a very secondary rôle.

However, since auricular fibrillation develops in approximately five per cent. of lobar pneumonias, it seems good policy to carry out a partial saturation of all these patients with digitalis. The individual is then prepared for active and rapid treatment of the disorder should it arise. Further, Cushny thinks it probable that fibrillation is the result of imperfect nutrition of the heart muscle, and it is possible that the tonic effect of the drug may assist the nutrition of the myocardium, and so actually prevent the appearance of an auricular fibrillation. Such a protective function would be of sufficient importance to warrant the prophylactic use of the drug in the acute infections.

Sir Robert Borden has written to Mr. Rockefeller expressing his appreciation of his gift of $5,000,000 to promote medical education in Canada. The letter reads: "I should like to express to you my deep appreciation of your munificent gift just announced, for the promotion of medical education in Canada. The friendly motives impelling you to this course, so finely disclosed in your public statement, are no less appreciated. You may be sure the gift will be of the greatest value to the medical profession here, which has nobly shown its worth by its conspicuous services in the war, in which your country and Canada fought as comrades in arms to preserve a common ideal. I trust the relations between these two neighbouring countries will always be inspired with the spirit that has animated your action."

Retrospect

INTERNAL HYDROCEPHALUS

By H. P. Wright, M.D.

Dandy and Blackfan: "Internal Hydrocephalus: An Experimental, Clinical and Pathological Study." *Am. Jour. of Diseases of Children*, December, 1914.

Dandy and Blackfan: "Internal Hydrocephalus." *Am. Jour of Diseases of Children*, December, 1917.

Dandy, W. E.: "Ventriculography following the Injection of Air into the Cerebral Ventricles." *Annals of Surgery*, July, 1918.

Dandy, W. E.: "Extirpation of the Choroid Plexus of the Lateral Ventricles in Communicating Hydrocephalus." *Annals of Surgery*, December, 1918.

Dandy, W. E.: "Fluoroscopy of the Cerebral Ventricles." *Bull. of the Johns Hopkins Hosp.*, February, 1919.

Blackfan, Kenneth D.: "The Early Recognition of Hydrocephalus in Meningitis." *Am. Jour, of Diseases of Children*, December, 1919.

PRIMITIVE man was inclined to worship those things that caused wonderment, and it is said that in some parts of Russia whole villages worshipped their cretins and hydrocephalics. One infers that the villagers unconsciously selected from their midst the unintelligible to communicate for them with the unknown deity.

Physicians and surgeons have been interested in hydrocephalus from the time of Hippocrates and Galen. Sylvius and Magendie greatly advanced our knowledge of the condition, and Hilton was the first to point out, in England, the physiological and pathological significance of the foramen of Magendie.

In 1907 Flexner noted that internal hydrocephalus sometimes followed the injection of meningococci into the subarachnoid space of monkeys, and in 1914 Dandy and Blackfan produced internal hydrocephalus experimentally, in animals.

Their series of experiments showed:

1. That by occlusion of the aqueduct of Sylvius by means of a cotton pledget, hydrocephalus could be produced.

2. That occlusion of the aqueduct of Sylvius and extirpation of the choroid plexus in the lateral ventricles resulted, thirty-five days later, in hydrocephalus, although it was not so severe as in the first experiment.

3. That low obstruction of vena Galena magna may result in the production of an internal hydrocephalus, but high ligation has no such effect.

The formation of cerebro-spinal fluid. Dandy says experiments in animals have proved the following facts:

1. If the foramen of Munro is occluded, a unilateral hydrocephalus results;

2. But if the entire choroid plexus of this ventricle is removed at the time the foramen of Munro is occluded, this ventricle will be obliterated;

3. Therefore, cerebro-spinal fluid forms from the choroid plexus and not from the ependyma.

The absorption of the cerebro-spinal fluid. The cerebro-spinal fluid is completely absorbed and removed at least every four to six hours, or six times in twenty-four hours, and absorption takes place directly into the blood through the entire subarachnoid space.

Communication between the ventricles and subarachnoid space was demonstrated by means of neutral phenolsulphonephthalein. The communication from the third to the fourth ventricle is by way of the aqueduct of Sylvius, and from the fourth ventricle to the subarachnoid space through the foramina of Magendie and Luschka.

In 1918, Dandy presented the following classification:

- Hydrocephalus
  - Diminished absorption of cerebro-spinal fluid
    - *Communicating hydrocephalus*—Due to adhesions in the subarachnoid space.
    - *Obstructive hydrocephalus*—Due to
      - (1) Congenital atresias;
      - (2) Adhesions—acute, chronic;
      - (3) Tumours.
    - *External hydrocephalus?*
  - Increased production of cerebro-spinal fluid
    - *Acute hydrocephalus*—Increased fluid from inflammation in acute meningitis and trauma.
    - *Communicating hydrocephalus*—Due to occlusion of the vena magna Galena.

From a clinical point of view the two main types of hydrocephalus are: *obstructive* and *communicating*, and fundamentally these are similar, in that they are due to an obstruction in the cerebro-spinal circulatory system. The only reason for subdividing hydrocephalus into groups is that the anatomical difference in the two types necesitates an entirely different operative procedure for treatment.

1. The obstructive type of case results because the cerebro-spinal fluid cannot escape from its place of origin in the ventricles, where the absorption is negligible, to the subarachnoid space where the absorption normally occurs, because the channels of communication are occluded.

2. Autopsy records of cases classified clinically as communicating showed a barrier of very dense adhesions at the base of the brain. In each case the foramen of Magendie and one of the foramina of Luschka were sealed by adhesions, and the other foramen of Luschka was patent to a certain degree. The adhesions completely encircled the brain anterior to the patent foramen of Luschka and the basal cisternæ—cisterna magna, cisterna pontomedularis, and cisterna interpeduncularis—were completely obliterated by these adhesions. The dye tests showed a reduction in absorption from the subarachnoid space to about one fourth or one fifth of the normal. This roughly corresponded to the diminution of the subarachnoid absorbing area due to elimination of the cerebral subarachnoid space by adhesions.

Comparison of two types. Both are due to a diminution in the absorption of cerebro-spinal fluid. Both are obstructive and differ only in the location of the obstruction. In communicating hydrocephalus the obstruction is probably always the result of adhesions.

Meningocele and internal hydrocephalus. Only in those cases of meningocele in which a normal absorption of the dye is present from the spinal fluid as expressed by the finding of the dye in the urine, should the meningocele be removed; otherwise a secondary condition of hydrocephalus is sure to occur.

Meningitis and hydrocephalus.—Percentage of meningitis cases in obstructive hydrocephalus is 58·3 per cent. Percentage of meningitis cases in communicating hydrocephalus is 100 per cent.

Diagnosis of internal hydrocephalus. The early recognition of internal hydrocephalus is extremely important as treatment must be employed before destructive changes have taken place in the cerebral tissue surrounding the ventricles. For hydrocephalus, if recognized early enough, may be a curable disease, and this is de-

monstrated by the not infrequent cases that have been cured spontaneously, though usually at a time when cerebral destruction has left the patient a hopeless imbecile.

The following procedure should be adopted in all cases of clinical hydrocephalus and other cases of a doubtful character, or in which hydrocephalus cannot be ruled out; as further investigation will probably show that internal hydrocephalus is more common than is at present suspected.

1. Examination of the eye grounds.

2. 1 c.c. of neutral phenolsulphonephthalein* is introduced into either lateral ventricle and a lumbar puncture done half an hour later. (Some of this spinal fluid withdrawn should be referred for a Wassermann test.) As the majority of cases of hydrocephalus occur in infancy, very often the anterior fontanel is patent and it is a comparatively simple matter to penetrate a lateral ventricle. In older persons it is necessary to trephine before entering the lateral ventricle. If communication exists, the dye will by that time have appeared in the spinal fluid. If an obstruction exists in the ventricular system, the spinal fluid will remain colourless.

3. Having proved that there is no communication between the arachnoid and subarachnoid space, it becomes necessary to demonstrate that one is not dealing with a so-called communicating hydrocephalus. This is satisfactorily proved by injecting a neutral solution of the dye into the spinal canal and estimating the total amount of dye excreted in the first two-hour specimen of urine. Normally the dye first appears in the urine six to eight minutes after injection into the subarachnoid space, and from 25 per cent. to 60 per cent. is excreted in the course of two hours. As a rule, in obstructive hydrocephalus, the spinal fluid is under diminished pressure.

4. A further refinement in diagnosis may be carried out by fluoroscopy and ventriculography following the injection of air into the cerebral ventricles. In the *Annals of Surgery* for July, 1918, Dandy describes the technique to be employed. In February, 1919, he published an additional note stating that he had no fatalities in seventy-five cases varying in age from three months to fifty-five years, and that several unsuspected cases of hydrocephalus had been demonstrated. The amount of air injected varied from 40 to 300 c.c. In a case of hydrocephalus it takes about two weeks before all the

*This neutral phenolsulphonephthalein has been specially prepared by Mr. H. A. B. Dunning, of Hynson, Westcott and Dunning. A serious reaction will follow the use of the ordinary dye solution used for kidney studies.

air has disappeared. It is claimed that this further refinement is of value in diagnosis and localization in many intracranial conditions.

Treatment. The most important factor in successful treatment is early recognition of the condition, and, as meningitis is so frequently the cause, more frequent diagnoses and successful treatment of meningitis should, to a large extent, prevent the occurrence of internal hydrocephalus.

When the disease has once become well established, treatment is not hopeful, first on account of cerebral injury that is likely to have resulted, and, secondly, because of the difficulty of operation.

In the December number of the *Annals of Surgery* for 1918, Dandy describes the steps of the operation necessary for removal of the choroid plexus in communicating hydrocephalus. The description of the operation is clear and well illustrated. He had operated upon four cases, three of which subsequently died; the fourth, a case of meningocoele with communicating hydrocephalus, was operated upon early (first or second week) and was alive ten months later and doing well.

Conclusion. The work of the last five years has considerably increased our knowledge of hydrocephalus. Operative treatment does not seem to hold out much prospect of success, but the earlier recognition of the exciting cause may, in many cases, lead to the prevention of hydrocephalus, or in some cases to the cure of the early form of the disease.

Obituary

DR. HERBERT J. HAMILTON

Doctor H. J. Hamilton, one of Toronto's most prominent physicians, died at the Wellesley Hospital, February 5th, aged fifty-five years.

He was born at Brampton, Ont., received his preliminary education at its High School, and his medical education in the Toronto School of Medicine. He graduated with his M.D. degree from Victoria University in 1885, and his M.B. degree from the University of Toronto in 1886. In the latter part of the same year he obtained the L.R.C.P., London.

He returned from England to Canada in 1887, and after practising for a time at Woodhill, Ont., he removed to Toronto in 1894 where he soon acquired a large practice, which he retained until January of this year, when he had an attack of influenza with some rather serious heart symptoms. Pneumonia supervened and caused his death within a few days.

He took a very active interest in educational and professional matters. He was for some time a member of the Senate of the University of Toronto, a member of the Ontario Medical Council, and also a member of the Board of Trustees of St. Andrew's College, Toronto. He was a Past President of several Medical Societies, including the Toronto Clinical Society, the Toronto Academy of Medicine, the Ontario Medical Association, and was the President of the Toronto Æsculapian Society at the time of his death.

DR. WILLIAM STAIRS MORROW

THE sudden and premature death of Dr. William Stairs Morrow, from myocardial disease, has removed from the profession one of its most distinguished cardiologists.

Born in Halifax and educated at Merchiston School, Edinburgh, he took his medical degree at McGill University, graduating in 1891 with high honours. Soon after graduation he entered the Department of Physiology under the late Professor Wesley Mills, whose Chair he later on temporarily filled with eminent satisfaction to his students and colleagues. It is due to his initiative and genius that the first laboratory of Practical Physiology was established in McGill University, and was conducted by him for years with the greatest efficiency. During his activities in this department, he published a work on the Venous Pulse which was authoritative, and which commanded the attention and approbation of eminent specialists in other countries.

Dr. Morrow's originality of thought and scientific mind were all too restricted through the exigencies of a private practice, made necessary through the insufficient remuneration of his academic position. He was a man of simple tastes and varied interests. In earlier career he was a prominent athlete, and in later years was especially interested in music and literature. He was a authority on Browning whose works he loved to quote. His was a well spent life, and in his death many families will mourn a lost friend, and the profession a loyal adherent to high ideals and practical purity.

Dr. James B. Campbell, of London, Ontario, died at his home on February 9th, of pneumonia following influenza. Dr. Campbell was a graduate of the Western University in Arts and Medicine, and took his post-graduate work in Europe. He had practised in London for twenty years and was associate professor of medicine on the faculty of Western University. He recently served as Captain and Medical Officer of the 7th Regiment.

Dr. Harry Gove died at his residence in St. Andrews, New Brunswick, on January 27th.

Dr. G. H. Balleray who died at his home in Paterson, New Jersey, at the age of seventy-two, was a graduate of McGill University and of the New York College of Physicians and Surgeons. He was a member of several British and American medical societies.

Dr. Walter Ross died at Ottawa of pneumonia on February 6th. He graduated from the Manitoba Medical College in 1909. He served at the front as medical officer during the campaign on the Somme. Invalided to England he was appointed D.A.D.M.S. at the Canadian Hospital at Shorncliffe, and later served in the same capacity at Buxton and Liverpool, with the rank of major.

Dr. W. J. Weekes, of Ottawa, died at his residence of heart disease, on February 22nd. He was eighty years of age.

Miscellany

News

MANITOBA

A deputation from the University of Manitoba has petitioned the government to consider the provision of an extension of the medical college and to grant an appropriation this year for preliminary steps in connection with the new university at Tuxedo. The addition to the medical college will be for the purpose of physiological and scientific laboratories.

DR. J. HALPENNY recently gave a series of short course lectures at the University on social welfare work and the need for the improvement of social conditions in the province.

A SUCCESSFUL year with new avenues of service was reported at the annual meeting of the Victorian Order of Nurses in Winnipeg. Treatment has been given in 1,140 cases, and 5,132 visits paid. A training school had been established which is affiliated for its social service work with the General Hospital, milk depots, public heath work, Margaret Scott Mission and the Juvenile court. Work had also been accomplished in the far off districts of Kootenay, Labrador and Christian Island.

DR. GORDON BELL, provincial bacteriologist, speaking before the Winnipeg branch of the Sanitary Association of Western Canada recently, said the danger from the epidemic of encephalitis in the province has abated. The doctor has personally investigated every case of "sleeping sickness" reported in Manitoba.

THE public health nurses held a two weeks' conference in Winnipeg and were addressed at their final sessions by the provincial epidemiologist on the subject of tuberculosis, by Dr. T. G. Mather, of the pscyopathic department of the General Hospital, who demonstrated the Binot-Simon test for the grading of the intelligence of children, and by Judge McKerchar of the Juvenile Court who described to the nurses the working of the department for neglected children.

THE report of the Winnipeg General Hospital shows another successful year marked by progress and expansion, but with a deficit reduced from $64,067 to $55,624. The sum of $180,523, subscribed by the drive, was gratefully acknowledged, and the hope expressed that the objective of $200,000 would be reached when returns were completed. In the outdoor and social service departments 6,530 patients were treated, free of charge, throughout the year and 22,506 consultations held. The new psycopathic clinic has proved a great success. A pre-natal clinc has also been recently added.

ALBERTA

DRAFT plans have been prepared for the erection of a new medical building for the University of Alberta. The estimate is $750,000, more class room and laboratory accommodation is

urgently needed. The registration of medical students for the present term has reached one hundred and eighty. The freshman class alone number seventy-two.

DR. HAROLD ORR has been appointed by the provincial government to take charge of the administration of the venereal diseases act; clinics for the examination and treatment of cases will be located in Edmonton and Calgary, and when the need arises, at Medicine Hat and Lethbridge.

THE Canadian Red Cross Society acknowledges the receipt of $434.75 from the United Farmers' Association of Alberta for relief work. In the recent examination for nurse's registration, held at the University of Alberta, twenty-nine candidates were granted certificates.

AT the annual meeting of the Edmonton Hospital Association it was the unanimous feeling that pressure should be brought to bear on the Dominion Government to make that body realize the necessity of restoring the civilian hospitals to the community and of supplying the necessary hospitals for the treatment of returned soldiers; a resolution to that effect was carried.

DR. J. PARK was re-elected, at the organization meeting of the Edmonton board of health, to be chairman of the board for 1920. A resolution was passed asking the local academy of medicine to issue a pronouncement of their views as to vaccination. Dr. Whitelaw stated that, wherever possible, all who had been exposed to a case were vaccinated and no secondary cases had occurred.

SASKATCHEWAN

THE Saskatchewan Red Cross Society is establishing three Red Cross outposts or health centres in the northern district of the province for pioneer settlers who need nursing and medical help. These outposts will be small hospitals, each with six or eight beds, and accommodation for two nurses. The settlers will provide sites and erect buildings, the nurses will be supplied by the Victorian Order, and the Red Cross will equip and maintain the outposts for at least two years, or until they are self-supporting.

THE Saskatchewan Military Hospital at Moose Jaw is now closed and the building reverts to the former school authorities.

PROVISION for the creation and training of a class of certified women to be known as nursing housekeepers has lately been introduced in the Saskatchewan Assembly.

BRITISH COLUMBIA

THE Government intends to establish a provincial health laboratory which will probably be divided into two branches; one in connection with the Vancouver General Hospital, under the charge of Dr. J. A. Campbell and Dr. Gibbs, and the other to be attached to the Royal Jubilee Hospital in Victoria, under the charge of Dr. Miller.

DR. F. T. UNDERHILL, medical health officer, emphasized the hospital shortage in a report laid before the civic health committee, and suggested the building of a hospital for Infectious Dieases containing several hundred beds, to accommodate all the municipalities of Greater Vancouver, and to form an essential part of the General Hospital extension scheme, each of the municipalities to contribute to the common cause.

DURING the past year, the dental clinic under the supe vision of Dr. Pallen attended to three thousand cases among the children in the Vancouver schools. A prophylactic clinic, consisting of one doctor and a nurse, visits the various schools to educate the scholars in the care of the teeth.

ONTARIO

THE honorary advisory council for scientific research at its last meeting made provision for 1920 for forty bursaries, studentships and fellowships, to be awarded to qualified science graduates who will train for a career in scientific research in connection with the natural resources of Canada.

SIR JOSEPH FLAVELLE recently presented a cheque for $250,000 to the trustees of the Toronto General Hospital as a contribution towards lifting the debt of $835,000 on that institution. As Sir Joseph contributed $100,000 some years ago, the present gift brings his total subscriptions up to $350,000; it was given to assist the trustees who have undertaken to raise $500,000, if Toronto and the University will each contribute $125,000.

Medical Societies

MENTAL HYGIENE CONVENTION

THE third convention of societies for mental hygiene, under the auspices of the National Committee for Mental Hygiene in co-operation with the Mental Hygiene Committee of the State Charieties Aid Association, was held in New York City February 4th and 5th, 1920.

The Canadian National Committee for Mental Hygiene was represented at this convention by its president, Dr. Charles F. Martin, Dr. A. H. Desloges, medical superintendent of the insane asylums in the Province of Quebec, Dr. G. S. Mundie, of Montreal, and Dr. C. M. Hincks, of Toronto, secretary of the committee.

The annual meeting of the National Committee for Mental Hygiene was held in the Russell Sage Foundation Building on the afternoon of February 4th. At this meeting the reports of the medical director, Dr. Thomas W. Salmon, of the associate medical directors, Dr. Frankwood E. Williams and Dr. V. V. Anderson, and of the other different officers were read. Dr. Charles F. Martin, president of the Canadian National Committee for Mental Hygiene, addressed the meeting and spoke of the need of more mental hygiene instruction in our medical schools, and also of the importance of neuro-psychiatry in the training of our medical students. He said that although he was an internist primarily, he had come to appreciate the importance of these subjects in the education of the physician. Dr. A. H Desloges gave a short account of what was being done along the lines of mental hygiene in the Province of Quebec and expressed the hope that the idea of having International Mental Hygiene would soon be accomplished. Dr. Hincks spoke briefly on what the Canadian National Commi tee for Mental Hygiene had accomplished since it was founded in 1918. He mentioned that the Provinces of Manitoba and British Columbia, after having a survey made by the Committee, had formulated plans which eventually would place these provinces in the front rank as regards the treatment and care of the mentally abnormal.

In the evening, at the New York Academy of Medicine, the late Dr. E. E. Southard, director, Massachusetts Psychiatric Institute, Boston, contributed an excellent paper on "Trade Unionism and Temperament; Notes on the Psychiatric Point of View in In-

dustry". Dr. Thomas W. Salmon, medical director of the National Committee for Mental Hygiene, gave a paper entitled "Psychiatry in Medical Schools". In this paper he emphasized the importance of the teaching of psychiatry to medical students and he spoke of how very few medical schools to-day gave but slight attention to this important branch of medicine. He also referred to the fact that New York City had hospitals for the treatment of every disease except mental disease. This important paper by Dr. Salmon will be published in the April issue of the *Canadian Journal of Mental Hygiene.*

The following afternoon was devoted to the reading and discussions of papers by Dr. John B. Watson, Johns Hopkins University, Baltimore, on the "The Psychology of Infancy" with cinematographic demonstration by Dr. C. Macfie Campbell, of the Henry Phipps Psychiatric Clinic, Baltimore, on "The Experiences of the Child, How They Effect Character and Behaviour": by Dr. E. Stanley Abbott, medical director, Mental Hygiene Committee, Public Charities Association of Pennsylvania, on ' Programme of Mental Hygiene in the Public Schools"; and lastly by Dr. William A. White, superintendent, St. Elizabeth's Hospital, Washington, D.C., on "Childhood, the Golden Period for Mental Hygiene".

On Thursday evening papers were read by Dr. Pearce Bailey, chairman, New York State Commission on Mental Defectives, on "Applicability of Neuro-Psychiatric Examinations in the Army and Civil Problems", and by Dr. Thomas W. Salmon on "Some Mental Hygiene Lessons of the War".

All the meetings were well attended by the leading psychiatrists and social workers of the United States and full discussions took place on all the papers. Besides these meetings, round table discussions took place every morning at which the various phases and activities of the mental hygiene movement were discussed by the leading men and women of the country. These discussions included "Financing Societies for Mental Hygiene"; "Problems in Connection with the Establishment of Community Clinics"; "Relative Values and Methods of Publicity"; "Problems of Legislation"; "State Society Problems Relative to Discharged Soldiers"; "Planning and Organizing Conferences."

The delegates from the Canadian National Committee for Mental Hygiene were enthusiastic over the reception given them at the convention and returned to Canada impressed with the many mental hygiene problems which had to be faced in their country, but hopeful of a ready response as soon as the problems were placed before the medical profession and general public.—G. S. M.